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THIRD ALL INDIA PEOPLES' SCIENCE CONGRESS

VIDYANAGAR, BANGALORE

8-11, MARCH 1990

COMPENDIUM OF
PAPERS AND PROCEEDINGS

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KARNATAKA RAJYA VIJNANA PARISHAT
Indian Institute of Science Campus
Bangalore - 560 012

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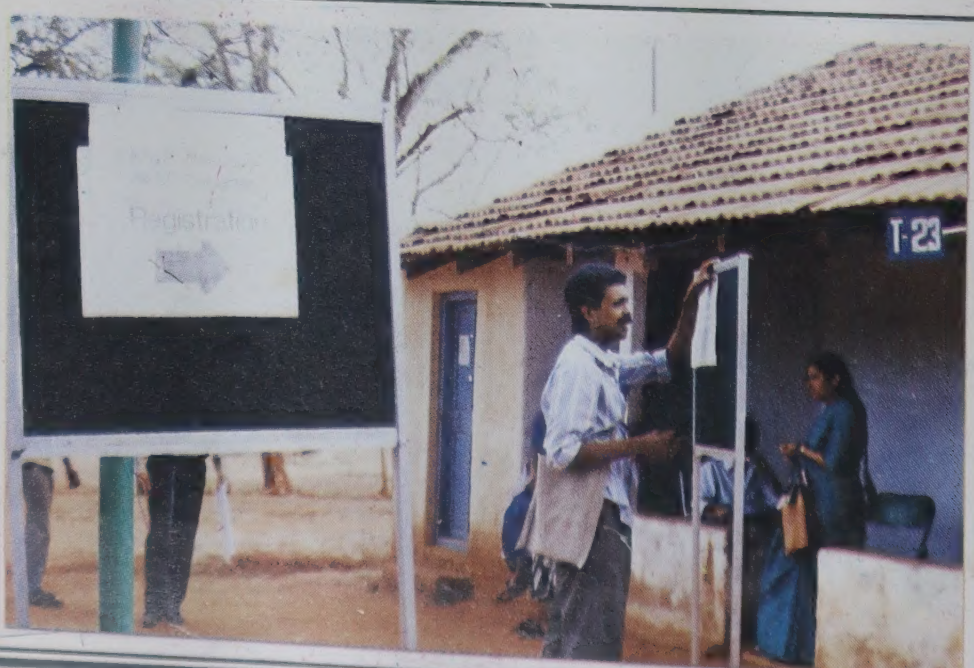

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Preface

The Third All India People's Science Congress hosted by Karnataka Rajya Vijnana Parishat was held at Vidyanagar, Bangalore District from 8th March 1990 to 11th March 1990. The Congress deliberated simultaneously in 3 sub-congresses on Literacy, Self-reliance and Health.

The Congress was inaugurated on 8th March 1990 by Shri. K. H. Ranganath, Hon'ble Minister for Education, Govt. of Karnataka. Prof. C. N. R. Rao Director, Indian Institute of Science presided over the session.

Papers presented at the Congress and popular science lectures delivered by experts are included in this compendium. We hope that this document of papers submitted at the Congress would be useful to the activities of People's Science Movements in the country.

The funds for the Congress were obtained from National Council for Science and Technology Communication, Govt. of India and Department of Science and Technology, Govt. of Karnataka. Karnataka State Council for Science and Technology also assisted us in the organisation of the Congress. We are thankful to these organisations for the valuable support extended to us.

I am highly thankful to Shri Dhruv Raina and Shri. M. R. Nagaraju of K.R.V.P. for having meticulously scrutinised the manuscripts and for having prepared them for the press. I am thankful to Prabha Printers & Publishers, Bangalore for printing the document neatly.

M. A. SETHU RAO
Secretary, KRVP
& Convenor
Third AIPSC

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LITERACY AND SOCIAL CHANGE

M.P. Parameswaran.

8 - 11, MARCH, 1990

Our country has been striving for radical changes in the lives of her people even after 43 years of independence. There has been dramatic progress in many fields of science and technology, medicine, communication, space science and so on. There has been a considerable increase in education and health care too. However, we still remain the most illiterate and most unhealthy nation in the world. The number of illiterates in India above the age of five is more than 400 million. This is nearly half of the total number of illiterates in the whole world. Same is the case with sick and unhealthy persons. The independence for which our elders fought and which we enjoy today has become meaningless to the vast majority stricken with abject poverty and illiteracy. Our country has become fertile ground for the operation of communalists, disruptionists, destabilizers and profiteers. We are in an unenviable situation. This has to change.

There are several forces working for change - political parties, trade unions, association of peasants, women, youth and students, cultural movements and so on. A mass movement for literacy can help all these forces.

The People's Science Movements of India have mounted a crusade against illiteracy in the form of Bharat Gyan Vigyan Jatha and the activities prior to and after it. This crusade against poverty, unemployment, exploitation and oppression is a part of general crusade for social change.

Literacy is a necessary, though not a sufficient, condition for a civilized society. Man became man with the emergence of articulate speech. And humanity became civilized with the evolution of written language. Throughout the history of human civilization, whether it is in Egypt or Babylonia, in China or India, Greece or Rome, one can find that the owners of writing skills were the rulers of the society too. In our country Brahmins and Kshatriyas, the ruling classes were the custodians of knowledge. They had with them the power of the written word. They also saw to it that the opressed, the slaves, the sudras are denied of the power of the letter. They pronounced" "Sudram Aksharasamykrutam Dooratah Parivarjyayet" A sudra with the knowledge of the letter should be kept a mile away! And they are kept miles and miles away from the letter, in Bihar, Madhya Pradesh, Rajasthan, Uttar Pradesh, Orissa, Andhra and also in most of the other states. There is one notable exception: Kerala. There, more than 80% of the people above the age of five are literate. This gave them power. It has become a weapon in their hands. Bertolt Brecht's immortal lines: "Ye starving man reach out for a book. It will be a weapon in your hands" have been fully vindicated there. They fought with that weapon and won quite a number of battles. Kerala is not the richest of the Indian states. In fact, it is one of the poorest, yet, all the indicators of the quality of life are highest in that state.

It has the highest life expectation which is close to that of fully developed nations, the lowest infant mortality rate and a crude death rate, it has also the lowest birth rate in the country. Studies conducted by a number of governmental and non governmental agencies and individuals have clearly established the close co- relation between literacy, especially female literacy, and the high quality of life observed in Kerala. True, as mentioned earlier, literacy is not a sufficient condition but it is a necessary condition.

Attempts to eradicate illiteracy in the past have suffered from the lack of national will, lack of societal and political support. The Kothari Commission Report on Education wrote twenty five years ago, on th question of illiteracy:

To put an end to this intolerable situation we recommend a nation wide coherent and sustained campaign for liquidation of illiteracy. The campaign should be inspired by faith in its vital significance to national life and should be organized and supported vigorously by the social and political leadership of the country. It should involve the central, the state and the local Government, all government agencies, all voluntary agencies and private organizations and institutions, all educational institutions ranging from universities to primary schools and above all, all the educated men and women in the country. A Lesser effort will fail to generate the necessary motivation and build up effective momentum..."

This massive effort was never put in. The marginal and submarginal efforts failed. There was no heart, no soul, no muscle behind these efforts. There was no national will, or societal will even behind the National Adult Education Programme launched in 1978'. The National Literacy Mission too, is yet to muster effective political and societal support.

The Bharat Gyan Vigyan Jatha is aimed at evoking this support. Discussions on mass literacy programmes often lead to the examination of the experience of successful programmes in other countries. More often than not one can find that mass literacy campaigns were successfully undertaken in countries where massive social changes, social upheavals were taking place. Many political scientists and social scientists argue that a mass literacy programme will not succeed unless a social upheaval takes place. In India that type of upheaval is no where in sight. What can be seen are secessionist, disruptionist fundamentalist upheavals like in Punjab, J & K, Assam, Bodoland, Ayodhya and where not. The question then is that should the literacy effort wait for a different type of social change to take place. The experience in Kerala, Pondicherry, Karnataka, Gujarat, West Bengal, etc. show that it is possible to mount a mass campaign for literacy even under the present circumstances. It would require persistent build up. But it is possible. Let us try to paint the scenario of such an effort.

In Eranakulam district of Kerala about 50000 volunteers participated as instructors and organizers in a Total Literacy campaign involving about two lakh illiterates and more than one million literates. The campaign in twenty talukas of Karnataka involved about one lakh volunteers, instructors and organizers. The total number of volunteer instructors, organizers,

learners and others involved in the literacy process during the past year will run in to millions and millions. But the individual contingents of this effort did not get the excitement and pride of being part of a larger group. Never before in the post-independence history of India were so many persons involved in one single national effort. But this fact was never noticed.

The feeling and pride of being Indian, the sense of unity and brotherhood, the joy of sacrifice that existed during the freedom struggle could not be retained for long after the winning of independence. Generally, it is only through a fight against a common enemy that people with divergent aspirations unite. In those days we had the visible, tangible energy in the form of the imperialist occupier with his bayonet and gun. The people fought and won. Khadi was, perhaps, the universally identifiable uniform of this people's army. It was not a war fought with guns. It was a battle fought by millions of workers and peasants, hundreds of thousands of students and youth using general strike, civil disobedience etc. as weapons. The strength was in the numbers. It was beginning to develop into a fight with weapons too. It was at that time the enemy decided to leave, but not without leaving behind its shadow in the form of communalism. Since then, this enemy has grown from strength to strength and has joined hands with poverty, illiteracy, unemployment etc. on the one side and disruptionists destabilizers and mafias on the other side. They are tangible, but not visible. They cannot be focussed on to. An all out fight against one group of enemies may bring in a type of unit which will make it difficult for the other group to survive and to get nourishment. The most diffused and the most wide spread of these enemies is illiteracy and its consequences. No body dares to call it a friend at least openly. All others have got open friends. Can we mount a war against illiteracy and rally the entire country behind it? Will that, in the process make things hot for the disruptionists and destabilisers? Will the unity so forged and strengthened by the ability to learn for the themselves through literacy empower the majority of the people to take command of the situation, to involve themselves in decision making, to participate creatively in the running of the affairs of the society and thus lead to a part of the development which will put an end to unemployment and poverty? This is the hypothetical question.

One thing must be understood at this stage of discussion. The development of Science and Technology, man's understanding of the laws of the nature and the capacity to transform it has made it possible for every human being in this world, not only the present five billion, but also yet another five billion to obtain its basic biological needs like good clothing, shelter, and health care. Further, all can be provided with the cultural requirements like education and recreation too, A truly human life, and not an animal like existence, is possible for each and every human being. But the irony is that nearly half of humanity live under subhuman conditions, many of them under even worse than animal conditions. The reason for this is perhaps that human beings have not yet learned to organise in such a way that it is not necessary for a small group to become ferocious animals brandishing nuclear weapons and star war threats and keep the majority under subhuman conditions. Attempts to recognize society have been going on. The most successfull ones were those made in the socialist countries. But recent developments in the socialist countries the world over have shown that things are not as rosy as they have been supposed to be. If one looks closely at the

happenings in these countries we can see a common factor everywhere: absence of the participation of the people in a creative way in running the affairs of the society. True, this is the case not only in these countries, but also in the so called democracies of the world, including the oft boasted largest democracy, that is India.

The call of the epoch is a participative democratic social order. This is not easy to achieve. Obviously no sensible person will welcome an exploitative and oppressive social order. History cannot go backwards. The present happenings in the socialist block cannot take it back to the days of capitalism with unemployment, poverty and squalor, with multimillionaries and mafias. Neither subjectively nor objectively does humanity want rule by drugs and arms mafias. When there is a possibility to build a heaven on this earth itself, why should we convert it into a hell? But to achieve this, a new form of societal management is required. It is no longer desirable to leave the affairs of society in the hands of a few chosen leaders. Experience has shown it. The only alternative is effective democracy where all members of the society take part creatively in the running of its affairs. This is easier said than done. The very development of man's ability to transform nature, the growth of Science and Technology has made effective democracy more difficult. The whole of humanity is objectively being welded into one machine, by the growth in science and technology, whole of transport communication, information creation and transfer. Even the smallest happening in any corner of the world will have its reverberations all over. But humanity is not still seized of the situation. It's subjective understanding does not match with the objective situation. This unfortunately, is that of a positive feed back system. Even small perturbations can feed on itself and grow into catastrophic conflagrations sowing much sorrow and destruction. The events that followed Indira Gandhi's assassination, the events in Bihar, Kashmir, at the international level the happenings in Romania, Azerabazn, America or earlier Turkey and Iran, Cambodia and elsewhere are examples of such oscillations. The local societies or groups, whether in one country as a whole or within each country, are totally helpless in front of global happenings, initiated by another local society. Effective democracy, at this stage of human development, will require relative autonomies to local groups or to put it in another form, larger local control on localman-nature interactions This is the higher stage in the development of science and technology and of social organization. At present this is made difficult by global control exerted by transnational co-operations with the help of science and technology.

The development of productive forces in the contemporary era demands a transformation in the social organization, into effective, participative and creative democracy. This is not possible if only a selected few in the society control the forces of production. Knowledge - science and technology - is an important element in the modern forces of production. The entire community should be able to wield these forces. It cannot be left to 'leaders' and specialists' alone. This is what the present epoch in history demands. Either we rise to the occasion, or face the consequences, which may be, possibly, total annihilation of life itself from this planet!

Placed in this global, panhuman context India can play, perhaps, a crucial role. If we can convert the present passive democracy in this country of ours into an active and participative one, its impact on the world will be, atleast by sheer size, quite substantial. We are 800 million, nearly one sixth of the world population. Strengthening of our local economy, local effectiveness, or in others words self-reliance will have a loosening effect on the stranglehold of global economy controlled by comparatively small group of transnational corporations.

But how can we do this? During the past 43 years we have been following a path of relying on 'small groups', selected leaders of society, educated in our selected institutions of excellence. The result is that we are farther away from self-reliance than we were at the time of independence.

If we follow this path any further, opening up our country to the transnational corporations in the name of technological excellence, and relying on Public Schools, Navodayas, IITs, IIMs etc., We will be only moving farther way from self-reliance. Our strength to function as a negative feed back in the context of global catastrophic oscillations will decrease further. We have to charter a path relying on the people of India, relying on their active and creative participation in the nation building process. An illiterate population cannot participate creatively in this. Mere literacy too will not suffice. They should be able to take command over the affairs of the nation. Herein comes the importance of science and technology. Without the help of Science and Technology today nobody can take command over the affairs of a society, however small it may be.

The Bharat Gyan Vigyan Jatha is intended to initiate a mass movement for literacy and scientific awareness. It is a massive churning process. It will involve about a million people distributed in about 500 towns and about 6,00,000 villages.

The first product of the mythological 'manthan' of 'Kshira sagara' was, we were told, the deadly poison 'Kalakoota'. The initial products sprining up from this 'Bharat Manthan' too are equally bad-the cynics who argue that 'this will not work' things cannot change etc. Instead of joining hands and trying to make it succeed, they stand apart and criticise. For them, anything and everything can happen only after something else has happened. Cynicism and fatalistic pessimism are the Kaalakoota poisons killing our country and even humanity. The nectar of scientific optimism, an optimism based on our knowledge and ability, only can save humanity from self destruction. This nectar comes out in a trickle in the form of little successes and the confidence they generate in the minds of the people.

The first droplets of nectar will be, it is expected, in the form of, about one million volunteer instructors and a few thousand excited workers. Almost six lakh villages will be touched in this churning process. The volunteers can be formally enrolled during an 'Akshar Daan Week' from 1st to 8th September. On September 8, the International Literacy Day

Akshar Daan rallies can be organized in all the 60000-70000 centers of the BGVJ and if possible in all the villages surrounding each centre. Even during the freedom struggle, such a massive mobilization on a single day would not have taken place. The knowledge that each such rally is part of a massive all- India effort itself will bring excitement to the people. Patriotism and the pride of being Indian can play a very valuable role in this programme. This patriotism is not against anybody but for every body. At the rally the volunteers shall take the Akshar Daan Pledge. The learners can take the Akshar Adhyayan Pledge. Atleast 200 million people above the age of five have to be made literate. This would require the services of about 20 million volunteers. It is towards this the services of about 20 million volunteers are required. It is towards this the first lot of one million volunteers are recruited during the BGVJ. If successful- and there is no reason why it should not succeed this will initiate a chain reaction which will throw up the necessary number of volunteers. This chain reaction will not stop at literacy. Neither should it. Firstly the organizational structure built up of this purpose can easily resonate with the Panchayathi Raj institutions. This can, and perhaps, will face opposition from vested interests. But the momentum of 200 million learners and 20 million volunteers should be able to overcome It. In fact this process has already started. In the state of Kerala about 3 million learners and half a million volunteers are being mobilized. In Tamil Nadu, Karnataka, Pondicherry, Goa, and West Bengal together yet another about 2 million learners and 2-3 lakh volunteers are being mobilized. Gujarat alone is trying to mobilize an equal member of learners and volunteers. All over the nation the figure would easily come to 10 million learners and one million volunteers.

Literacy work can help social change. It is possible. But it will not be realised unless it is planned meticulously and efficiently. A heap of uranium will not become either a reactor or a bomb. It is to be organized. The greatest challenge today is this organization, its conflicting requirements. On the one hand it has to be intensely local, on the other hand it is to be a well knit organic whole-the dilemma of planned decentralization. It has this model that we are trying to build up, on the one hand through the people's science movements and the All India Peoples Science Network, and on the other hand through intense interaction with Panchayathi Raj institutions and local and national developmental efforts. The linking up of the scientific technological community with the larger problem of national development on the one hand and with the diverse micro-mini medium area development problems on the other hand, through the extensive and well connected network created for literacy work is a worthwhile experiment.

LITERACY PROGRAMME IN EIGHTH FIVE YEAR PLAN (1990-95)

L. Mishra
Joint Secretary, AER and Director, National Literacy Mission;
Govt. of India

The expansion of educational facilities for elementary, primary, upper primary and secondary education and the equality of access in the matter of educational opportunities have been the hallmarks of our planned economic development since independence. This has been evident in an increase in the number of educational institutions, an increase in the number of teachers, an increase in gross enrollment of the number of students as well as an increase in the overall outlay in elementary, primary and non-formal education. During the period from 1950-51 to 1986-87, the number of primary schools increased from about 2.10 lakhs to 5.37 lakhs, that of middle schools from 13595 to 1,37,196, that of primary teachers from 5.33 lakhs to 15.22 lakhs and of middle school teachers from 85496 to 9,79,072. Equally impressive has been the progress achieved in the enrolment of children. During 1950-51 to 1986- 87, the enrolment in classes I to V increased from 19.1 million to 89.9 million. In terms of outlay, there has been a massive increase from Rs. 93.00 crores in 1950-51to Rs.1900.00crores in 1980-85. The number of literates has also increased from 60 million in 1952 to 240 million in 1981.

2. Despite such massive coverage and increase in the overall literacy percentage from 5.35 in 1901 to36.23 in 1931, the number of illiterates in the country has increased considerably. According to the 1981 census, the number of illiterates in the country was 42.43 crores out of which 35.71 crores were in the rural areas. Of the 35.71 crore illiterates in the rural areas 20.32 crores were of the female sex. There are a number of factors which can be attributed to the failure in achieving the goal of universalisation of elementary education leading to a progressive increase in the number of illiterates in all age-groups in general, and in the adult age-group (15-35), in particular. Besides a rapid increase in population which overtakes the number of persons receiving education, some of the other factors are high dropout rates, illiteracy of parents, motivation, education not being related to the needs of the people, the phenomenon of a large number of working children being compelled to supplement the income of their parents, rigidity of the formal system,the long distance of schools from the place of residence which in turn is responsible for the denial of educational opportunities, the social and cultural barriers preventing parents to send their children particularly girls and various other environmental, infrastructural, management, pedagogical and training related problems.

3. These problems and constraints have been identified from time to time and corrective measures have been provided to improve the quality of learning, increase the motivation of teachers and pupils, arrest the high drop-out rate and prevent relapse into illiteracy. The National Education Policy (1986) and the Programme of Action formulated thereunder have provided a new sense of direction in these areas through measures like "Operation Blackboard" intended to bring about an improvement in

physical facilities in all primary schools, a revised and expanded programme of non-formal education for school drop-outs, working children and girls, detailed school mapping exercises to cover all habitations with a minimum population of 200, a phased time-bound programme of elementary education for girls up to the primary stage by 1990and upto the elementary stage by 1995, increasing woman's access to vocational education, cent per cent enrolment of SC/ST children, reorganisation and improvement of the management of education, articulation of a national system of education, pre-eminence of people's involvement with the education process at all levels.

4. These measures may not, however, substantially affect the status of approximately 100 million illiterates who are in the 15-35 age group and who have remained illiterates because of the interplay of various social, economic, cultural and other factors at a time when they could have received an education, illiteracy is not of their of making or volition but an accident, a product of an unfortunate situation. An overwhelming percentage of them are women and members of scheduled castes and scheduled tribes living in rural areas. For no fault of their's they have remained cut off from the national mainstream for long. They are intelligent and resourceful, often mature and sensible. They have the latent energy, creativity and a strong sixth sense but in the absence of access to the world of information through the print and non-print media, they lack the means of converting their energy into resources and resources into strength. A number of research studies have established a close nexus between literacy and development, and the need for the eradication of illiteracy is no longer a subject of debate or discussion. It cannot any longer be a matter of speculation or chance but a matter of national conscience, of grave national anxiety and concern.

National Adult Education Programme (NAEP)

5. NAEP launched in 1978, despite some of its initial successes, could not prove to be as effective as it was envisaged on account of various environmental, infrastructural, pedagogic and management and training related deficiencies like lack of participatory training, unattractive environment in the adult education centers resulting in the demotivation of learners, absence of foolproof and scientific management information systems, insufficient involvement of voluntary agencies,irregular learners' participation, weak delivery of components of functionality and awareness, absence of linkages between basic literacy, post-literacy and continuing education arrangements, lack of mass media support, inadequate political and administrative support of state Governments and panchayati raj institutions, etc.

National Literacy Mission

6. The concern for and sensitivity to the plight of millions who on account of illiteracy cannot be effective partners in the process of national development prompted the central government to launch the National Literacy Mission in 1983. The NLM aims at providing functional literacy to 80 million adult illiterates by 1995. This objective implies that the persons made literate would achieve self-reliance in literacy and numeracy, become aware of the causes of their deprivation to participate effectively in the development process, acquire skills to improve their economic status and general well being and imbibe values of national interaction, conservation of environment, women's

equality, observance of small family norms, etc. The three important implications of NLM are the existence of unmistakable political will and commitment, application of tested and proven scientific and technological research for the benefit of the deprived sections of the society and involvement of all sections of society such as political parties, employers, trade unions voluntary agencies, youth, teachers, students, house-wives, exservicemen, prison management staff, cooperatives and banks and other financing institutions. Viewed in this context, the NLM is at the some time a national mission, a technology mission and a societal mission. The important strategies to achieve the objectives of a NLM include increasing motivation, securing people's participation, increasing involvement of voluntary agencies infecting the on-going programmes, launching mass movements for literacy involving educational institutions,teachers students youth,ex-servicemen, employers, trade unions, cooperatives etc, institutionalising education through establishment of Jana Shikshan Nilayams (JSNs), ensuring availability of standard teaching/learning material, technology demonstration for development, transfer and application of techno-pedagegic inputs and an effective management information system.

Important Achievements under NLM

7. The important achievements in the field of adult education, after the launching of NLM in 1988, include building up of an environment conducive to literacy, encouraging response from multifarious agencies for participation in the programme, improvement in training programmes, standardisation of a number of teaching/learning materials, a move towards computerised management information systems and providing a few pedagogic inputs in selected technology demonstration districts. The thrust under the programme has shifted from mere enrolment to attainment norms, preventing and minimising the incidence of drop-out as well as relapse into illiteracy by providing a linkage between basic literacy, post-literacy and continuing education. The number of voluntary agencies participating in the programme has increased to about 750.Mass campaigns aimed at complete eradication of illiteracy in selected districts/blocks have met with considerable success. Whereas the state government of Rajasthan has already involved about 1.70 lakhs school students,the state government of Orissa and West Bengal have taken decisions to involve all school students in the programme as part of their work experience. Over 30000JNSs have been sanctioned to cover adult education centres run under the aegis of RFLP, SAEP, voluntary agencies, NYKS, and University Dapartments of Adult & Continuing Education. The Kottayam city and Ernakulam district in the state of Kerala have already achieved total literacy. Other such projects which have met with varying degrees of success include Saksharta Abhiyan taken up by the Gujarat Vidyapeeth, project relating to eradication of illiteracy in 20 taluks in the state of Karnataka, and literacy project in Coimbatore district taken up by the Shanti Ashram, Coimbatore.The NLMA has also approved projects relating to the complete eradication of illiteracy in the states of Goa. and Kerala and the Union territory of Pondicherry. Other such projects which are in the process of formulation include 70 blocks through centre-based and 50 blocks through mass campaigns in the state of Bihar, Srikakulam district in Andhra Pradesh, 300 villages in Rajasthan, eight hilly districts in Uttar Pradesh, 40 taluks in Karnataka, Sindhuding and Warvcha district and one additional taluk in every district in Maharashtra and 70 blocks in the state of

Orissa.

8. Several deficiencies, however, continue to inhibit the overall effectiveness of the centre-based programme. Some of these are lack of understanding of an adherence to time bound span for eradication of illiteracy in compact areas, malpractices in the selection of instructors and other functionaries, delay in procurement of teaching/learning material, delay in payment of honorarium, of back up support, lack of proper physical facilities at the centres, and excessive emphasis on quantitative rather than on qualitative achievements.

Adult Education in VIII Five Year Plan

9. During the VIII Five Year Plan the programmes are to be designed in such a way that within the available resources, the objectives set forth to be achieved by 1995 are achieved in real terms. There will not be one but a variety of approaches like the centre-based approach, the volunteer based approach and campaign approach which will be adopted for bridging the gap between covered and uncovered areas. Endeavours would be made to identify and remedy the various pitfalls and shortcomings in the computer based programme to strengthen and consolidate it rather than going in for large scale expansion. Simultaneously, quantitative changes and improvements would also be brought about in the programme. The strategies proposed to be adopted during the VII Five Year Plan to achieve NLM's objective would be as under:

(i) Reorganisation of project pattern: The NAEP Review Committee which studied the programme in all its comprehensiveness and submitted its report in 1980 observed that the project size of 300 centres is too large. It recommended that it should be reduced to 100-200 centres so as to improve the efficiency and to achieve economies. The deficiencies and shortcomings of the centre based approach have been examined at length keeping in view the experience in the past few years and on an objective and dispassionate consideration of the whole issue, it is felt that any replacement/closure of the centre based programme atleast for the time being (in a situation where we are confronted with a large gap between the areas covered and areas yet to be covered) could result in total disarray. During the VIII Five Year Plan the centre based programme would be governed by a well spelt out strategy, taking late account of the deficiencies already indicated. The important features of the reorganised project pattern would be:

(a) **Consideration for small projects:** The project size with 300 centres is too unwieldy to allow proper management, effective organisation and meaningful supervision. Besides such big projects are not cost effective, most of the reorganised RFLP/SAEP projects would be run in the form of projects of 100 centres each. The existing projects will be reorganised accordingly. Each project will run in a compact area, taking up all habitations.

(b) **Area approach:** An essential requirement in the modified strategy would be an insistence of eradication of illiteracy through area specific and time specific action plans, drawn up and implemented with vigour. For all practical purposes, the only criterion of effectiveness of a project in future would be the extent to which it is able to eradicate illiteracy in a well defined area within a prescribed time frame. A project once sanctioned would continue without waiting for any further approvals, till the end of the planned time schedule. In the case of voluntary agencies willing to take up a centre based approach, the adoption of an area approach with the objective of complete eradication of illiteracy would serve as precondition for the purpose of release of grant.

(c) **Improved Pace and Content of Learning (IPCL)** The innovative technique of IPCL provides for reduced duration of learning, improved motivation of learners and functionaries and an inbuilt mechanism for evaluation including self-evaluation by learners. it should be introduced in as many adult education centres as possible from 1990-91, the ultimate objective being to switch over to this technique in all the centres with the first 3 years of the VIII Five Year Plan. It is hoped that with heightened motivation, which will be the key issue in the new technique, the rate of drop-outs would come down and with the possibility of installing almost two cycles of an Adult Education Centre (AEC) in a year, the programme as a whole would be cost effective, while ensuring a longer coverage.

(d) **Mobilisation and involvement of community with the programme:** Community involvement would be secured in conducting household surveys, selection and location of centres, selection of instructors, making available other inputs of community support from the community, etc. Formation of village education committees would go side by side with the survey and mobilisation of the community for literacy. The cooperation, support and help of other development departments would be secured in such a manner which would enable them to look upon adult education programmes as their own.

(e) **Management, reorganisation and review:** The essential aspects of reorganisation would include (j) a clear delineation of responsibility, and tasks with well defined accountability for all concerned; (ii) review of suitability and need of existing staff; (iii) selection of staff through special selection procedures; (iv) priority for women in staff selection; (v) incentives for Preraks/instructors for a successfully completed programme of complete eradication of illiteracy; (vi) sufficient decentralisation and delegation of powers to project coordinators; and (vii) a proper computerised MIS alongwith external evaluation. With a view to ensuring that the switch over from the existing pattern would not be converted into reorganised projects in one go. The switch over will be in phases. It would be well planned and relentlessly implemented.

(ii) **Mass Mobilisation for eradication of illiteracy:** All available educated men and women in the country would be mobilised to constitute a force to eradication

illiteracy through a well planned national literacy campaign. These men and women would be students, non-student youth, teachers, ex-servicemen, army welfare organisations, house-wives, employers, representatives of voluntary agencies, non-governmental organisations, trade-unions, public servants in government offices and state undertakings, cooperatives, banks, JAYCEES Lion clubs, Rotary clubs, etc. In order that the mass mobilisation programme yields good results, the following strategies be adopted:

(a) **Holding of Jathas:** Bharat Gyan Vigyan Jatha Samiti will take up motivational activities through Jathas all over the country and identify literacy ambassadors who will have literacy programme organised in their respective areas.

(b) **Forms of Mass Mobilisation:** Depending on the situation, mass mobilisation for adult education would take many forms some of which would be (i) individual approach, under which students and other educated persons take the responsibility of making atleast one person literate. (ii) neighbourhood approach, under which educated persons would be encouraged to take up the responsibility of making all the persons of their family and families in neighbourhood functionally literate; (iii) Challa approach; (iv) community approach; and (v) member/customer- centred approach under which trade unions, cooperatives, banks, etc. would be encouraged to take responsibility for making all its illiterate members/customers as well as the illiterate members of their families functionally literate.

(c) **Area approach:** Agencies participating in mass mobilisation campaigns would be encouraged and assisted in projects aimed at the complete eradication of illiteracy in specified areas which would be a district or a group of blocks or villages.

(d) **Training for supply of materials:** The training of master trainers, volunteers, etc. would be arranged through State Resource Centres and DRUs and it would be ensured that teaching/learning material is made available in time.

(c) **Insistence on attainment of prescribed level:** It would be ensured that the learning outcome through the campaign approach corresponds to the level prescribed in the National Literacy Mission document.

(iii) **Mass Programme of Functional Literacy:** The programme will be implemented as a national campaign and as a societal mission in which all sections of society like teachers, students, house-wives, ex-servicemen, educational institutions, voluntary organisations, employers in public and private sectors cooperative societies, financial institutions and every one else will be fully involved in the challenging task of providing functional literacy to 80 million adults. The state of Rajasthan and the National Progressive Schools Conference have already made a beginning, involving involvement of 1.70 lakh teachers and 7000 school students respectively in 1989-90 in the programme as part of the work experience. It is hoped that the other states will follow suit soon. All the state governments will

once again be requested to pass necessary resolutions from their Boards of School Education. To give effect to the recommendations of the Central Advisory Board of Education to involve all school and college/university students in the process, consultations would continue to be held with representatives of teachers and students. It is hoped that within the next 2 years, all the 18.00 million students from class IX onwards would have already become agents of literacy. Their participation would be secured on the basis of a mixed package of persuasion, compulsion and voluntary participation. Individual and institutional incentives would be introduced to attract students as well as the institutions to join the movement on a voluntary basis. Detailed actions plans, both at the macro and micro level would be formulated involving components like environment building, survey, selection of the area of operation and identification of master trainers and volunteers, training, production and supply of literacy kits, actual imparting of literacy, media coverage and support, arrangements for post literacy and containing education and evaluation of learning outcome and monitoring. Insistance would be on prescribed levels of learning. Other agencies would be involved in taking up the responsibility of making all illiterate persons within their organisations and illiterates within and around the locality of volunteers fully literate in a prescribed time span. Attempts would be made to bring about further integration of adult education with other development programmes with a view to improving the motivation of the learners as well as the instructors.

(iv) **Involvement of Voluntary Agencies:** Even through the number of voluntary agencies participating in the programme has increased to a great extent a continued resource crunch, multiple levels of processing, difficulties in preparation of area approach, lack of guidance, support and help in documentation and information gaps have been some of the factors preventing effective involvement of a large number of voluntary agencies in taking up a large number of projects for eradication of illiteracy. During the VIII Plan period, a larger number of agencies will be identified and involved in the programme to take up responsibilities for the complete eradication of illiteracy in well-defined areas, run JSNs and other programmes of continuing education, organise training programmes for instructors/preraks/supervisors, prepare and publish learning materials, undertake experimentation, innovation and action research, produce audio and video materials and help in the creation of an environment. Zonal and district level conferences would be organised. To identifiy good and reliable agencies Print and non-print media would be involved in a big way for projecting the success stories of voluntary agencies through curtain raisers, interviews etc. The procedure for release of grant-in-aid would be flexible. It would also be necessary/to degovernmentalise the control and monitoring system, to the extent possible, by allowing VAs to institute their own system of reviews and joint evaluation as participatory and cooperative exercises with a view to improving the technical aspects and logistics of programme delivery. There would be total mutual trust and understanding between government and non-government organisations. As far as possible, NGOs would be allowed to function as social pressure groups to ensure that target groups served through literacy and post-literacy activities contribute to and benefit from the development programmes.

(v) **Mobilisation and enrolment of adult illiterates belonging to SC/ST:**. It is estimated that out of the total illiterate population of 110 millions in the age-group of 15-35, the number of illiterates belonging to SC/ST communities was 41.6 million. Out of 80 million adult illiterates to be covered by 1995, the number of persons belonging to these communities works out to 32.4 million. This works out about 40%.5% of the total number of illiterate adults to be provided functional literacy by 1995. During the VIII Five Year Plan, special measures would be taken to ensure that all the adult illiterates belonging to these communities are fully covered. Some of the specific measures proposed to be taken in this regard include: opening of maximum number of Centres in Harijan Bastis/ST homes; appointment of maximum number of instructors preraks and supervisors from amongst SCs and STs; production of billingual primers; making content of Adult Education Programme to be in tune with the preferences, felt-needs and interests of the members belonging to SC and ST community; providing books and literature for neoliterates which amongst other things would include the components of legal literacy so as to make them aware of the provision of various laws for the social, economic and multi-faceted development of members of SCs and STs communities; making use of important sayings of saints on literacy for promoting literacy; involving association/organisations of SCs and STs In the programme; arranging discussions with the Development Functionaries at the centres in SCs and STs basties and hamlets encouraging institutions working for SC and ST to develop suitable material and training courses for learners; and providing flexibility in the number of learners in an AEC depending on the availability of learners in tribal areas and less densely populated areas.

(vi) **Emphasis on women adult illiterates:** The female literacy rate according to 1981 census being only 24.82 percent against the male literacy ratio of 45.84 per cent, there is need for special emphasis on environment and retention of women adult illiterates in various programmes of adult education during the VIII Five Year Plan. This would be attempted through opening of atleast 50% of the centres for women; the appointment of large number of instructors and preraks from amongst women; organising special training programmes for women functionaries; revision of the content of adult education programme to make it of direct interest and relevance to womens problems; providing flexibility in timing of adult education centres so as to suit the convenience of women learners, providing information about various schemes and programmes affecting the lives of the women, in adult education centres and involving a large number of women students in the programmes.

(vii) **Post Literacy and Continuing Education:** To ensure that the neoliterates coming out of both the centre-based and volunteer-based programmes do not relapse into illiteracy, facilities for post- litercy and continuing education would be set up. During the VIII Five Year Plan, this would be attempted in a phased manner through setting up of 1.2 lakh Jana Shikshan Nilayams by 1994- 95 throughout the country; making every JSN a centre of mobilisation so that it becomes a permanent centre for environment building and awareness generation giving priority for setting up JSNs in rural areas, involvement of all sections of community

in JSN movement; selection of good and motivated preraks for running the JSNs; making arrangements for effective and decentralised training for the preraks; giving representation to women in JSNs; committee/village education committee to enable them to take fully advantage of facilities in JSNs; preparation, production and distribution of good quality reading material for the neo-literates in the JSNs setting up linkages of the JSN programme with the programme of Operation Blackboard, the Library Movement of Raja Ram Mohan Roy Library Foundation, existing libraries in rural areas of different States and Public Libraries at the State and district level; advising the State Governments to spread the Library movement through enactment of Library Legislation; and ensuring coordination of JSNs with various development departments and their functionaries so that it could function as a single window of development information providing simple and short duration training in vocational skills.

(vii) **Media and Communication:** The media plays an effective role as a tool of environment building as well as an instrument for spreading the message of literacy and for actually imparting literacy. During the VIII Five Year Plan, the emphasis would be on the creation of a small core group of communication professionals; identification of high quality professionals, researchers, trainers and producers for preparation of software for publicity for the programme; involving AIR and Doordarshan to play a more positive role in disseminating the message of literacy, broadcasting and telecasting of adult education programmes, radio plays, films on adult education, organising interviews, quiz programmes and curtain raiser programmes with a veiw to sensitizing the viewers about the Mission and its objectives; production of high quality programmes through SRCs, DRUs and other voluntary agencies for broadcast and telecast; involving creative thinkers, writers, assisting outstanding adult educators in developing programmes which are imaginative, perceptive and appealing to the viewers and involving folk media in the shape of theatre and cultural troupes (like Harikatha, Burra Katha, Opera, Yaksha Gana, Pala, Daskatha etc.) in spreading the message of literacy for creating an environment both in the urban and rural areas; and and enabling the new institutions like JSNs and DRUs to become local nerve centres of communication activities and developing the expertise in the utilisation of mass media like radio and TV.,

(ix) **Management Information System:** It is hoped that the IVIS system being developed in 42 TD districts would fully become operational by end of 1990. This would be replicated in the maximum number of districts the target being to cover all the districts within the first 2-3 years of the VIII Five Year Plan.

(x) **Technology Demonstration:** Improved technology in the field of adult education does not mean only improvement in the lighting arrangements and supply of inputs like improved black-boards chalks, slates, improved hurricane lanterns, improved petromax light, etc., but also an improved technique of learning. Such of the techno-pedagogic inputs (TPIs) as are already tested and proven will be adopted and used in the adult education centres, For such of the TPIs which are technically feasible in the rural areas, innovation and research will continue to be

undertaken in collaboration with various agencies already identified for the purpose so that the same could be experimented and adopted for universal application on the basis of results achieved. The collaborating agencies would also be encouraged to take up more TPIs for experimentation, innovation and research, particularly in field of low cost technology.

Dimensions of financial resource need for adult education:

10. The adult education programme has may challenges some of which are too complex and indeed daunting. One major challenge comes from the sheer size of the programme. The second major challenge is that unlike the case of drinking water and immunization instant results are not achieved in literacy, which is a long drawn out process calling for a lot of patience, counsel and tolerance. The third major challenge is the wide diversity in geographical, typographical, geo-hydrogical and agro climatic conditions which make the adoption of a plethora of flexible approaches imperative. During the VIII Five Year Plan provision would be required to be made for making 05.50 million adult illiterates (15.5 million backlog from the VII Five Year Plan and 50 million adults originally proposed to be covered during VIII Five year Plant). This target does not merely involve enrolment coverage, but that a number of persons be made functionally literate. Keeping in view the fact that the effective achievement is much less than the enrolment the proposed coverage during the VIII Five year Plan has been fixed at 104.00 million so that the actual number of persons who are eventually made literate are atleast 65 million, which incidentally is the target of the NLM. Requirement of funds for the adult education programme during the VIII Five Year Plan, as projected to the Planning Commission are of the order of Rs. 1637.40 crores (both central and state sectors).

SELF RELIANCE - CONCEPTUAL PREMISES

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Technology and Science have become key elements in structuring economic and military power. Along with this, access to technology is rapidly becoming the new element ordering international relations. Technological dependence engenders economic and political dependence. Technology can be bartered by those who have it to those who have not, in order to secure control over markets and natural resources. This perception is contained not only in radical thinking but also in the right wing of the American Political spectrum. Henry Nau, an advisor to Ronald Reagan argues that global inter dependence makes it possible for advanced countries to use the advantage of superior scientific and technical expertise to impose a more subtle and total form of imperialism than was possible in any previous period of history" 1. Self reliance, in today's world' is therefore no more a nebulous, albeit noble goal but an imperative for retaining political and economic independence. Self-reliance as a national goal has been a consensum both in the national movement and in the Nehurvian era. With the rise of Korean, Taiwanese and other such economies, this concept is currently under attack for restricting the country's growth both in technological and economic terms. The pendulum today has swung to the other extreme with anything "foreign" in terms of technology is presumed to be more advanced and attractive, be it talcum powder, potato chips or computerised systems. The recolonisation of the national psyche seems already accomplished and only its translation in physical terms awaited, be it under the dispensation of an ex-pilot or his ex-finance minister.

TECHNOLOGICAL SELF-RELIANCE-THE EARLIER YEARS

In earlier years, a resurgent nationalism had proclaimed self reliance as a national goal. Like independence, political or economic, self reliance as a national goal. Like independence, political or economic, self reliance was thought to be self evident and needed little elaboration in conceptual terms. Control over political power, control over the finances of the nation and control over technology were seen to be three inter- twined strands in a free India. The struggle in its first phase was really to build industrial production in the country to meet the country's needs. A steel plant, an antibiotic plant, heavy machinery building plants were seen to be the bed rock on which self reliance could be built.

However, technological self reliance proved to be much more difficult and complex than taking control over the country's fiscal policies. It is now increasingly clear that building one steel plant does not automatically allow for expertise to build the next. Machines and the knowledge to build machines are not synonymous and self reliance has as much to do with technological knowledge and its continuous production as building industrial processes based on such knowledge. Being the tenth largest (now 16th) industrial power in the world and having the fourth largest technical and scientific pool of man power in the world still does not make us a major player in the game of technological development. It is here that we are

constrained to think of what elements constitute self-reliance so that we have a clear idea of the goals that we should pursue.

The immediate post independence period had another attitude to technology which perhaps needs a drastic overhaul now. Initially, India was confronted with a situation where industrial products and plant's were being imported; the task of self-reliance was seen to be one of largely import substitution. In other words, technology which arrived as one package, had to be unbundled. Decomposing of the technological package into its constituent elements and the reconstitution as one import substitution product was the sine qua non of this period. Obviously, this concept of self-reliance is valid only for the limited period where technology was being largely imported and we were the technological innocents. In a period where development has already brought advances in large areas, such a static view of technological self-reliance being one of unbundling of technology is no long valid. We have, instead, to look on the dynamics of technological development and how we can enter this process as a major player rather than a subservient recipient nation.

TECHNOLOGY AND RESTRUCTURING OF INTERNATIONAL RELATIONS

It has been suggested that in the earlier periods, force, naked military force was the major element in structuring international relations. The markets and natural resources of other countries were controlled by the open use of force. The post colonial period has however seen the rise of new forms of control. Increasingly, International Monetary Fund and World Bank are invited to third world countries and are today instrumental in advising the recipient nations to allow global MNCs to "enter" long term control of their markets and national resources is not the issue here. The issue is that such control is now sought voluntarily under a Fund- Bank aegis.

Technology has emerged in the seventies and eighties as another element in the continuing restructuring of international relations. Increasingly, access to technology is being linked to domestic policies of the countries. Third world countries can have access to the technological goodies of US and other advanced national provided they behave in a particular way.

Fundamental to such behaviour is willingness to open their economies to MNCs. Political good behaviour is also a part of this scenario. Sign the NPT or else. One can multiply this at will. The real issue here is that technology is no longer bought and sold as a mere commodity. The monopoly position of a few countries in the world today allows them to dictate beyond the terms of exchange for a particular commodity. Control of markets and national resources therefore are bartered for advanced technology.

In this context, a whole new set of international regulations have come up. COCOM today functions as the gendarme of advanced capitalism. Favoured nations and not so favoured nations meet with different responses. The trilateral commission operates as an informal club of the technological haves who decide on an uniform response to the have nots in technology.

In this respect, it may be noted that the positions of the third world countries have worsened further from that in the first period of decolonisation. The collapse of much of the socialist world and the crisis of their economies have removed at one go a major bargaining counter that the third world had. The absence of products in the socialist world means that technology intensive industries are now only with a few western nations. And they seem to be far better organised in order to extract monopoly benefits than the technological have nots.

Before all the above is seen as a conspiracy theory, it will be relevant to look at the nature of US trade technological intensive industries. We also reproduce the perception of the American Political leadership regarding the international use of technology.

The value of advanced technology has grown steadily in US trade in the last decades. Between 1969 and 1979 for example, US trade surplus in R&D intensive goods rose from $10.5 billion to $39.3 billion while during the same period, deficits in non R&D intensive goods rose from $6.7 billion to $34.8 billion. The target proportion of this increase from $3.4 billion to $23.3 billion was from sales to third world . It has also been observed that Multinationals are reluctant to export processes to the third world while they are quite eager to enter into collaboration for products. One survey of twenty three major companies showed that when new technology was developed as a product, in 72 percent of cases it was transferred abroad through foreign subsidiaries, 24 percent by unaffiliated licensing and only 4 percent by direct exports. foreign subsidiaries were used only in 17 percent of the cases; unaffiliated licensing and only 4 percent by direct exports. In contrast, where technology took the form of a new process, foreign subsidiaries were used only in 17 percent of the cases; unaffiliated licensing was never used. In 83 percent of the cases innovation was exported only as products, the process remaining protected at home. No wonder George keyworth, Reagan's Science advisor, has described US leadership in science and technology as an economic imperative and stated that other industrialised nations will have to shift to even higher technologies and services [2].

The conversion of this monopoly to one of political control was undertaken by Henry Kissinger. Diny Lee Ray, a former Chairman of Atomic Energy Commission, was to describe it critically as a policy of "If you do what I want in some sort of political situation or alignment or whatever, then you will get access to our science and technology". Technology now constituted the chips in the international poker game of diplomacy with US holding the major source. However, private business interests in Us did not agree whole heartedly in such a venture. They in turn suggested that apart from political, economic and business considerations should also be considered in providing such access. In all this, David Rockfeller, Chairman of Chase Manhattan Bank was instrumental in forging an informal alliance of the international business elite in the form of a Trilateral commission that played a key role. The trilateral Commission was responsible for much of the business response to advanced technology and its use in international relations. Its influence can be judged from the fact that President Carter and Zbrigniew Brzezinski are members of the Trilateral Commission.

We do not propose to go further in cataloging the various speeches and writings of US and other leaders on the importance of technology to global relations - both political and economic. Suffice it to say that overwhelming evidence exists to show that advanced captalist countries are offering technology to the third world at a price - the price of control of their markets, natural resources and ultimately their politics. Technological exchange is but another terrain in the struggle amongst nations for the control over the global market and natural resources.

The new form of international control is far more insidious and seductive than the earlier forms. Forced control of national economies resulted in large scale protests. Contrast this with the eagerness with which MNCs are now being wooed all over the world. The siren song of the MNCs sap the capability of nations to develop technology on their own. The interdependent world sees various nations integrating themselves at the global level but at different hierarchic levels. And those at the bottom enter such a global market on grossly unequal terms. Self reliance is not a quest for a mere economic technological objective. It is a battle for national independence and should be recognised as such.

SELF RELIANCE - SOME DEFINITIONAL ASPECTS

We have examined the need for self reliance in the global context of inter dependence. There is little doubt that national economies cannot hope to survive as independent entities. Integration on a global scale s too visible a phenomena for us to hearken back to a vision of Gandhian autarchy of nation states. We are not advocating a return to isolated national economies as the solution to the problem of unequal relations between nations. The rapid movement of technology, its rapid obsolescence and renewal, the instability of production processes all preclude such a possibility. The global integration is here to stay and we have to redefine self-reliance in this context. As we have already identified, the failure of the policy of import substituting as "self-reliance" is to be traced to the refusal to come to terms with the changed scenario.

If production of all goods locally and technology is precluded how can self-reliance be defined? As we have already agreed against the possibility of such a policy, obviously self-reliance means something different from merely localised production of goods and knowledge. Further, in any serious sense such an autarchic course is available, if at all to near continental economies - perhaps - China, India etc. Obviously such a course is not open to countries whose population are miniscule compared to these countries. However, Srilanka and Switzerland enter the global economies at different hierarchic levels, dictated neither by sizes nor population. Obviously, Switzerland is self-reliant in a certain sense while Srilanka is not.

From the foregoing, it is perhaps clear that technological self reliance is entering into an "equal" relationship in the exchange of technological goods. The volume of exchange is not the issue. The issue is the nature of the relations engendered by such an exchange.

The definition of self reliance in this way immediately opens up a host of questions.

Obviously, we are defining self-reliance by another concept which may appear to be equally nebulous - equal relations. Unequal relations are the result of technological dependence and not vice versa. And therefore, it can be argued that such a definition is really circular. While accepting acertain validity of this reasoning, I would still argue that unequal exchange is the identifying aspect of dependence. Why a certain set of exchange relations are equal while some are not, needs to be examined further as such an examination shall provide the basis of self-reliance today.

While an asymmetrical relation of exchange identifies the lack of self reliance, the causes of such asymmetrical relations must be sought in the way technology is being produced. In conventional wisdom, advanced technologies are science based. The increasing penetration of science in technology makes technology more dependent on large scale production of science. As large scale production of science is largely restricted to advanced nations obviously the third world can hope to match the advanced countries only by similar large scale production of science and developing science based technologies. And to cap it all, as they are backward economies, they can not really hope to do the above.

The above set of arguments is seriously flawed on a number of counts. A picture of science driving technology which in turn motors development, develops into a classical egg - chicken problem, when it is seen that development, in turn, fuels science. Further, I do not really know of any technology which is "occult based". Therefore any talk of "Science based" technology does not seem to square with existing ground realities. Lastly, the above scheme is rather fatalistic, and only deep depression can result from such an analysis. No wonder a number of countries are throwing in the towel and inviting MNCs in as the only way to development.

I would suggest the following countervailing characteristics in the trail of science, technology and development. In developing countries, scientific man power is available far more cheaply than in developed countries. Therefore the ability to undertake "science based" technologies is cheaper than in the developed countries. As the main advances of scientific knowledge are internationally known and disseminated in spite of US attempts to thwart the same, available scientific knowledge is adequate to develop these "science based" technologies. Both the production of science and the production of technology can be pursued more cheaply in countries like India than in advanced countries. And one can always use the massive Indian market to nurture atleast a few such advances.

The second countervailing trend is that despite all attempts to keep knowledge and technology secret, such is not really the case. Once a development is found feasible and known to be so, the rest is a matter of apportioning resources for the same. One can easily see this in the case of super conductivity and the ensuing global race when a certain class of materials were found to be superconductors. It is this realisation that is the motive force behind US attempting to create globally far more stringent intellectual property rights agreement so

that monopoly rights could be enjoyed by those countries and companies who already have a technological lead.

My argument here is not that these countervailing tendencies are effective today. It is only to advance the view that the countervailing tendencies exist which can be made use of to advance technologically instead of sitting back and wringing one's hands. And if production of technological knowledge is seen to be the key issue, the third world is not as disadvantageously placed as might otherwise appear.

I would argue here that technological dependence is the product of the global power of the MNCs. The MNCs seek to integrate various economies at various levels of hierarchy. Such an integration takes place due to the initial pool of technological resources they possess backed up by the enormous control they exercise over the global market. A technology developed elsewhere has no such market and may be forced to sell its knowhow cheaply to MNCs if it has to reach a global market . Control over existing technology, fiscal resources and markets ensure the existing hierarchy and therefore the continuation of unequal relations.

It is interesting to observe how the result of such unequal relations affects the perception of planners and entrepreneurs. It presupposes that advanced technology can only be the preserve of the West. Indian planners and entrepreneurs have been talking of the billion dollar software market. However, in actual practice, Indian companies have been seeking only the data punching or equivalent low lev . markets which has much less value. And this work is being done by the best of minds available in the country through the lure of foreign assignments. Very few attempts are made to create the new generation of software nd try sell this abroad. To cap it all, ofcourse we have the Indian industry rejecting all Indian software unless it is imported from the West under their aegis. It s ironical that quite often we get Indian software at Western prices as we feel that the Indian products cannot be considered for high tech applications.

This section perhaps has painted a rather gloomy picture of current realities. In the next section I will try and advance a line of development, albeit in restricted areas, of how self reliance can be developed despite these constraints. It is important to understand the nature of the problem before we attempt formulations to resolve the same.

I am going to restrict myself to software based industries primarily because I know them well and therefore perhaps I will be more to the point. Similar scenarios can be attempted in other areas also but ofcourse by people who know them well.

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SELF-RELIANCE; CONCEPTUAL ISSUES

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In the People's Science Movements (PSMs) as well as in both professional economic and popular parlance, the term self-reliance is often used. PSMs generally argue for national self-reliance-witness, for instance, the slogan of BJVJ in 1987 of "Science for the Nation". Offici government policy, as reflected in Plan documents and general rhetoric, speaks of self-reliance as a nationally accepted goal. But it is not always clear as to what exactly is meant by self-reliance. Given the complexity of the concept, there are bound to be nuances in understanding or specifying what self-reliance means. Nevertheless, for the PSM slogan of self-reliance to be taken seriously, and for it to become a mobilizational issue, it is important to attempt to specify at least the broad contours of the concept. This note is intended only to initiate a discussion that could lead to such a specification.

The broader concept of self-reliance used by economists, official spokespersons and lay persons alike refers to economic self- reliance (ESR). The PSMs have been somewhat more specifically concerned with scientific and technological self-reliance (STSR). Let us first take up ESR, then turn to STSR and round off the note with a few concluding comments.

ECONOMIC SELF-RELIANCE; (ESR)

The concept of ESR has essentially emerged in the context of economic development particularly of the countries which won political independence form colonial rule in the course of the great wave of national liberation and decolonisation following the second World War. The newly independent countries had, over the Seventeeth to Nineteenth centuries been forcibly integrated in various ways with the economies of their colonial rulers in particular, and the capitalist world economy in general. The perpetuation of these linkages after independence constituted a serious threat to national sovereignty. In India, the acute awareness of this in the period immediately following independence, when anti-colonial and anti-imperialist consciousness was strong, led to an emphasis on national economic independence and on import substitution. This was also in the interests of the domestic capitalist class which had a leading role in the post-colonial state. This was the broad politico economic context in which self-reliance was proclaimed as a national goal. As a concept at the economic level, this related to three aspects:

Role of external resource flows in resource mobilisation for development in the forum of official grants and loans and inflow of private foreign capital, both equity and loan.

* Role of imports and import-substitution.

* Import of technology

* Thus ESR essentially refers to the overall macro relationship of the national economy to the "rest of the world" which in the specific historical context means mainly the advanced capitalist economics.

It is our argument that self-reliance does not and should not imply 'autarchy' or plain and simple 'delinking' from the international economy. However, while the potential benefits of participation in the dynamic and growing international division of labour can be conceded, the realisation of these benefits depends critically on the terms on which a country is able to participate in this so-called international division of labour. After all, the historically inherited internal division of labour that exists today strongly reflects the unequal and unilateral integration of the erstwhile colonies into the world economy on the basis of the interest of the corresponding colonial powers. Given this understanding, economic self-reliance would include, Inter alia, the following:

Minimum reliance on capital-flows abroad, especially private equity capital

Development of a sufficiently diversified network of international commodity-trade relationships so that no external agency can exercise significant influence on domestic economic policy/development, and no "external shock" can destabilise the economy.

Extremely selective import of both commodities and technology

Where technology has to be imported, it should be on the basis of specified national priorities.

Strengthening of public sector which has been primarily responsible for such degree of self-reliance as our economy has managed to build and retain after independence.

Of course, it should be noted that implementation of a policy of economic self-reliance as broadly defined above would require a fundamental reversal of economic policies, which have been followed in the 1980s - policies which have promoted wholesale liberalisation and opening up of our economy to the dominant players in the international economy, and have seriously eroded the importance of both planning and the public sector. The trend towards large scale external borrowing including and increasing share of it from commercial sources has already led to a three-fold jump in our debt service ratio from 9% in 1980 to 27% by 1989.

SCIENTIFIC AND TECHNOLOGICAL SELF-RELIANCE (STSR)

STSR presupposes a policy of economic self-reliance as broadly defined in the previous section. It is, however, specifically concerned with self-reliance in the sphere of scientific and technological development.

The effort at STSR, like that of ESR, essentially began at independence. Under colonial rule there was naturally no effort to integrate science and technology and national production. Soon after independence, a conscious effort was made to develop a scientific infrastructure with several national laboratories and research institutes. With the rise of planning and public

sector- led growth there was an effort to use science and technology for national development and to link scientific and technological capabilities with production. However, these policies which led to several successes (e.g in fertilisers) came under increasing strain on account of the contradictions inherent in the overall strategy of development within which they were embedded. As a result, we face a contradictory situation. The planning efforts which were pursued with some degree of seriousness atleast upto the mid sixties have created a sizeable force of S & T personnel and a creditable network of scientific and R&D institutions. A limited development of our capital goods industry under the aegis of the public sector has been made possible by import substitution policies and help from socialist countries in the period of the first three plans. But with increasing reliance on external borrowing, and no large private capital, both internal and external, for development, the potential for scientific and technological self-reliance, thus built up has been seriously eroded in recent years especially in the decade of 1980s.

It is in this concrete political economy context that PSMs are grappling with the conceptual issues involved in scientific and technological self-reliance. It seems to us, in all honesty, that STSR is quite difficult to define. Any definition that is proposed will necessarily be not only somewhat arbitrary, but also incomplete and not without some degree of ambiguity. With these caveats, were propose that a definition of STSR should include:

* The ability to generate continuous improvements in existing technologies in use on th ground.

* The ability to absorb and adapt any imported technology, and innovate by improving up such technology taking into account local specifications quite alien to the context in the imported technology was generated.

* Creating and sustaining (autonomously) organic links between our S & T capabilities an the structure of national production.

* The ability to improvise and to create new technology related to the domestic resource structure and in response to national priorities, including such technology as may not in any way be related to the prevailing range of internationally known and traded technologies.

For these criteria to become ground realities, our entire approach to S & T policy has to be revamped. However, that would only be a necessary and not a sufficient condition. More importantly the establishment of linkages between domestic resource structure and domestic output structure is not merely a matter of S & T policy. And the question of whether the structure of output reflects the needs of the nation is a fundamental political economic question.

A PSM APPROACH TO PRIMARY HEALTH CARE

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The declaration of Alma Ata marked a historical step in the history of health. It was the first clear international declaration that health is a state of complete physical, mental and social well being, and not merely the absence of disease or infirmity and that it is a fundamental human right and that the attainment of the highest level of health is a most important world wide social goal whose realization requires the action of many other social and economic sectors in addition to the health sector [1].

The Alma-Ata declaration was a major step forward for it was based on an understanding and implied that

(a) 'the main roots of poor health lie in the living conditions and the environment in general, and more specifically in poverty, inequity and the unfair distribution of resources in relation to needs, both inside individual countries and internationally [2].

(b) That the people have the right and duty to participate individually and collectively in the planning and implementation of their health care. [3].

(c) Primary health care, defined as "essential health care based on practical, scientifically sound and socially acceptable method and technology.. at a cost that the community and country can afford to maintain at every stage of their development in the spirit of, self-reliance and self determination.. is the key to attain the target of health for all by 2000 AD'[4].

Unfortunately, despite the brilliant polemic and sweep of this declaration, it's implementation lags far behind, and now twelve years since its adoption in practical terms, at least in India, this great slogan has had little impact. Unfortunately, the World Health Organization who gave this call, has its contacts limited to the health ministries and to medical and allied professionals and it is to those sections that the task of implementing this programme went. One critic ruefully comments 'Handing over the implementation of PHCs to the medical establishment was similar to handing over the implementation of land reforms to landlords.'[5]. One outcome was to attach 'Health for all by 2000 AD' as a slogan to already existing or on-going programmes or to set new series of targets and then to device a series of selective vertical interventions- on immunisation, on iodization of salt, on family planning etc and to claim all of this as part of a primary health care implementation programme. Not only is this a negation of the primary health care approach, even the targets set in selective areas were seldom realized.

The other major thrust of the present primary health care programme, as it is in India, is the establishment of primary health centres and the deployment of community health workers- both at subcentres and at the village level. This too has run into serious problems, Not only is

the number of health workers that have been trained and deployed far short of what is needed, but even those who are deployed yield only a limited quality of health service. The selection, training, monitoring and motivation of the community health workers is so poor that most tend to drop out and some even migrate and set up as quack medical practioners themselves. "Community participation'-one important planned feature, is in most places completely absent. Almost no research, planning or training goes into identifying the problems and working out the tactics of health care delivery.

For the medical establishment, it is business as usual. The last ten years have seen the mushrooming of corporate private hospitals and a number of private capitation-fee based medical colleges. A few top eminently 'successful' doctors preside over the medical associations, act on medical councils, advice governments on health policy, serve on its committees and working groups, influence governmental decisions by virtue of their physician-level personal contacts with decision makers and in many a case even dominate research and private practice. The entire primary health care campaign and the Health for all by 2000 AD slogans are seen as empty politician's slogans or at best as the department of P & SM'S responsibility. Clearly no major change is likely to be contributed by these sections.

It must be recognised that members of the medical profession can do little in their professional capacities to achieve this goal. Medical and paramedical professionals are well positioned to investigate the causes and consequences of ill health. However they can rarely tackle the root cause of ill-health-hunger, poverty, shelter, water, sanitation, employment, leisure etc. Without tackling these basic questions-primary health care as spelt out by the Alma-Ata declaration is not realizable.

This differentiation between the wider concept of primary health care and the narrower concept of primary health services or basic medical services was not made in the original declaration. But subsequent discussions and debates have repeatedly pointed it out [6]. The basis of primary medical services relate to curative services for simple ailments, and injuries, care for the pregnant woman, family planning, immunization, and some degree of health education-all traditional areas of activity of health professionals.

It is possible with adequate political backing and administrative will to immediately achieve, such medical care at least in large areas of the country. It is possible for socially minded doctors, helped by donations or grants to provide such basic medical services in remote rural areas or even in urban areas where the poor have limited access to such health services. There is a record of numerous doctors from a wide variety of backgrounds, the catholic hospitals associations, the people's polyclinics of Andhra Pradesh, the work at Nagapur, at Chikamagalur etc., who have undertaken such work. Such work is valuable contribution but in terms of actual contribution to the health of the community as measurable

by indices the impact has only been marginal. The Impact on health itself becomes significant through the implementation of primary health care in its broader context. Though provision of health services and essential drugs are a part of the concept of primary health care, they are not the major part of the focus of primary health care.

This should not however be interpreted to mean that health professionals have no role in the implementation of primary health care. The word 'doctor' is itself the derivative of the word 'to teach' The doctor and other health professionals are looked upon as a source of knowledge about health and disease. Today many of the ideas prevalent about diseases, both right and wrong and most of the health polices have been contributed by the medical professional. To view disease as an affliction of an individual by a germ and lose its social dimensions is the result of the curative logical or managerial solutions to issues that are social in nature. The result of such a bias in the sphere of health policy is to search for technobias, that the PHC appraoch sets itself against. The doctor has contributed to such a bias and the doctor can contribute to its unmaking also.

The People's Science Movement and indeed all other individual groups and organisations desirous of realizing the goals enshrined in the Alma Ata declaration need to plan for intervention to prevent the demise of powerful concept "Health for All, by 2000 A.D." A great concept should not be allowed to degenerate into platitudes.

One of the primary areas that People's Science Movements can address themselves to is to create an awareness of what health is, to educate people of the causes of disease and ill health and the ways of preventing disease. To spread the understanding that most deaths, especially among infants, in India are preventable by very elementary measures and that it is possible to provide health for all - is itself a great step forward.

Health education has many limitations and pitfalls. Much of the health education current today is technical, fragmented and culturally inappropriate, other than being for that situation irrelevant. Thus a health worker may deliver a one hour lecture on diarrhoea, without even mentioning that the water source in that village should be safe. Instead she would probably preach a sermon on cleanliness, suggest using boiled water for all drinking purposes and finish with suggesting oral rehydration therapy. By the time she reaches the most useful part, both sympathy and interest would have been lost. Or a class on nutrition may tell all mothers assembled that they must give milk, eggs, fish fresh fruits and vegetables to their children - when most of them are going hungry for want of the ability to purchase rice. Even in many people's science movement lectures we tend to leave out social causes and possibilities of remedial collective action and instead stress on technical causes and individual solutions.

It would of course be of little use if health education lectures were only polemical or philosophical in nature and held that only curative knowledge needs to be imparted. But where collective action is the only real solution and the basic problem is a health determinant like

water or nutrition or sanitation, health education should be aimed at exposing such causes and appropriate remedial collective action. The health professional should provide the technical information if such is needed, to justify, a PSM effort to organising such action.

Could health by itself serve as an entry point for collective action? can the health worker become the agent of social change? Can oppressed people be organized around health issues? Though this debate is far from over, some Indian experiences have replied in the negative. Health work, they feel, has only political impact and without a proper political context genuine people's participation cannot be achieved in he area of community health work with ease.

However, most are agreed that 'health should be one of the activities of a group trying to organise the rural poor for justice and for development' 7,8.

The reception and popular response to proper health education is also limited by the dominant culture of seeking a pill or an injection as and instant remedy instead of trying to arrive at a more scientific understanding of the cause of disease. They come to the health professional for a 'cure' and not for knowledge. Many health education strategies therefore choose to combine therapeutic services with oral education - both within the governmental and in the non-governmental sections. Thus the women waiting to see a doctor in the queue before a primary health centre are given an half-hour lecture before he arrives, or while they are waiting for their turn. Or else after seeking the doctor they have to see a social worker who spends a few minutes talking to her about her disease. Both these of course are rare events, and only in an occasional centre, usually run by a socially conscious doctor, does this really occur.

Experiences in the People's Science Movement, though undoubtedly limited, have achieved the greatest success where health education has been disseminated in the form of a mass campaign. The media used includes popular lectures, slide shows street-theatre (the Kalajatha), posters and to limited extent video presentations. The popular response from the audience has been very positive but it is difficult to evaluate the gains of such general health campaigns.

Campaigns focussed on specific issues especially on the provision of essential drugs and the drug policy have had a much greater impact. The KSSP in particular by its wide dissemination of books on essential drugs and on hazardous or irrational drugs, have been able to make a mark on drug consumption and prescription patterns. To this end they have held seminars and guest lectures for doctors, compaigned in the local press, used posters and news papers and kalajathas to disseminate their views on drug policy. Their successful efforts to expose multinationals selling anabolic steroids by intervening in the usual 5 star hotel drug promotional campaign' also won them popular support and media coverage. Such a wide variety of activities and on such a large scale needs a major organisational network and this

the KSSP had. The KSSP's organisational growth is a result of the wide varieties of activities the KSSP takes up-covering issues like environment, science, education, health, rural technologies, science popularization, book publication and sales etc., to name a few. Undoubtedly the presence of such a wide base contributed to the success of such a campaign-for the KSSP membership and the people involved in the campaigns were from all walks of life-not only health professionals. These same advantages of being a broad-based organisation has helped all PSMs in carrying out effective health campaigns. The KRVP and the Lok Vigyan Sangatana are some of the other PSMs who have held such campaigns on health.

Another factor in the success of many KSSP programme is their educational campaigns not only on health but also on environment; They do not stop at awareness generation but go on to mobilize people for collective action. The scope for such health education campaigns which lead on to direct collective interventions by the people have not been adequately explored by other PSM groups and health activists mainly due to their organizational weaknesses.

But as the PSMs continue to expand, the scope for such action increases exponentially. It is possible now to plan for campaigns for total immunization or the control of diabetical diseases. It is also possible to campaign for the implementation of the distribution of iodized salt in the Terai and other lodine deficient areas of the north while at the same time opposing the ill advised move to ban common salt, commercialize salt production 'handing it over to large monopoly houses all in the name of preventing a wide incidence of goitre that is far from established.

It is possible today to campaign extensively for ensuring provision of the 25 essential drugs within 1 km of any habitation and for banning hazardous drugs. In select areas it may be even possible to launch health education programmes with collective action against diseases like guineaworm, infestations which are potentially easy to eradicate, and even against diseases like leprosy, measles which are potentially eradicable even within the present system with existing medical knowledge.

A successful health education work however needs a lot of careful planning and knowledge of local conditions and culture. He or she needs an analysis and understanding of the health problems involved. Given the bias of the medical establishment and official structures today, one is seldom able to rely on official documents and pronouncements alone to evolve a people's understanding of the issue. As a result one major area of people's intervention has been to study health issues critically, subject them to meaningful debate and evolve an understanding on major issues.

There are many groups notably the groups associated with medicos friends circle, A.I.D.A.N.. Delhi Science Forum, Kerala shastra sahithya parishat, F.M. R.A.I who have made major contributions in this regard. Though, due to their organisational structure, most such groups have limited themselves to presenting critiques such critiques are essential for future action. The critiques could have formed the basis for collective action by their groups like youth movements, women's organizations etc., but in practice such a cross-fertilization has not occurred to any significant degree.

Most such analytical, theoretical contributions are desk work relying largely on secondary data or compilations from various published sources. There are however a number of significant health surveys and field studies by health activists which has formed the basis for critiques. Health problems consequent to the Bhopal gas tragedy, occupational disease in selective areas and industries, the general health survey and the study of primary health centre facilities in Kerala are some examples of such intervention. It needs be pointed out that the major medical research institutes with elaborate research facilities seldom study such topics. The marked reluctance of such institutes to undertake study on areas of immediate relevance to people, especially if the topic is likely to be controversial and go against local vested interests, is well known. Unless health activists intervene actively in such areas of research work, the PSM's and democratic groups will be unable to intervene in both the formulation of health policy or even identify the deleterious effects of ill-conceived health or developmental strategies.

Even theoretical work, based on analysis of published data has a significant role to play. Drug policy is one area where health activists in India can take pride as being the sole force to have opposed the government's consistent pro-industry and anti- health policies. And most of this intervention is based on a study undertaken by various health activists themselves. Similarly on patent law and on iodisation of salt, official policies have become or are becoming the basis for collective action to press for a change.

The PSMs and the health activists command inadequate knowledge training, experience and resources to present meaningful critiques or evolve alternative strategies. There is an urgent necessity for health activists to widen its contacts among trained and sincere health professionals who can help. A large number of doctors, especially junior doctors and medical students and many with good academic backgrounds are interested in a social activity of the medical system and willing to contribute to it. Their participation in the work of PSM should be ensured.

Can PSMs go beyound health education campaigns (both general health awareness and on specific issues) and beyond presenting critiques and critical reviews of health policy? Can it attempt to tackle the concept of primary health care in its entirety? Can it by its work raise the level of health in a measurable fashion or contribute to such a rise in health status?

One approach to these questions is to work on a model-to take up an area varying in size from a village to a taluk or district and in this area attempt to render primary health care. Too often what is rendered is only basic medical services and then in the long run the results are not adequately rewarding. However there are attempts to integrate in such a model, basic medical services with major health educational campaigns introduction of scientific inputs to upgrade existing rural technologies and launching rural development schemes that generate employment, provision of better nutrition not only through income generation but by a more optimal use of available resources especially for children, provision of safe drinking water and elementary sanitation and above all literacy education and scientific awareness. The people's science movement is better equipped than most groups to implement such an approach. It has within its fields considerable experience in rural technologies, in literacy and non formal education, in running campaigns on issues especially using local art-forms as a vehicle for new ideas, in drinking-water and sanitation work - and in running basic health services. It should thus be possible for such a model to be built up with the available experience in the PSMs.

When building such models, one needs to remember the past PSM experience, that successful campaigns need a critical size for raising enthusiasm and for success. If work is too microscopic in dimensions, success is less and the project merely peters off.

What would be the socio-political implication of such a model? At this time it is too premature to make any prediction. Definitely, given existing social inequities such a model is not automatically replicable all over the country, by virtue of its being successful in one place. Even for the model to suceed social inequalities will pose a problem but we need not assume that they are insurmountable ones. (Such a model cannot therefore be posed as the road to success of primary health care).

Then what would such a model contribute?It could by its very presence and success help to pose the issue of an alternative strategy to health care and development. It could demonstrate that health for all is possible - now, given the administrative and political will. It would help bring, by virtue of its experience the issue of health on to the agenda of national priorities where it exists notionally but not in practical terms. In organizational terms, it would mean mobilizing new sections into PSM activities and adding a newer dimension to activities aimed at social change.

What we should not do when the PSMs take up primary health care work is to confine it to health services, and to health professionals. Thereby we would be going back to locating health issues as separate from other social problems and nurture the belief that good health can be won by technological or managerial inputs alone. PSMs can organize people around health issues only- if they link it up with other issues of development especially literacy, education and employment.

One area of expanding PSM activity that offers immediate scope for linking with the health

issue is literacy. The concept of functional literacy as understood by us includes an understanding of health. Literacy, and education by themselves, independent of all other factors have been shown to be major determinants of health status. Women's literacy, in particular, has been shown to affect, independent of other parameters, women' health, attitudes to family planning, number of children born and infant mortality. The process of imparting literacy is a useful vehicle for the generation of scientific awareness of which health awareness is an important aspect.

One major new area of contribution of PSMs is in adult literacy. With the landmark success of the Ernakulam campaign and the subsequent initial experience of the on-going total literacy campaign in Pondicherry, Goa and Kerala it is likely that PSMs can contribute significantly to health and literacy by their role in evolving and catalyzing mass campaign approaches to total literacy. The Ernakulam literacy project is now being followed by operation smiles - a project for 100% immunization in Ernakulam district. Diaorrheal deaths and mortality have come down significantly. In Pondicherry too a health phase is likely to follow the total literacy campaign.

The coming Bharat Gyan Vigyan Jatha being organized by the people's science movements of India is one major avenue for health activists to enlarge the scope of their work. The B.G.V.J. aims to organize cultural groups of volunteers from all walks of life in each of the 500 odd districts of India. In each of these districts the jatha will give performances at 120 to 150 centres. Their performance is aimed at creating an awareness of literacy and science. The basic organizational task of the BJVJ is to organize 60,000 centres all over India to receive these troupes. Each centre will also identify resource persons to give 10 lectures each on one topic. One of these topics is 'Being Healthy' a basic talk explaining the causes of diseases and the need and nature of Primary health care.

The generation of such a wide and diverse voluntary network of activists by the people's science movement opens up vast potentials for future action by the peoples science movement. Literacy is definitely the major follow-up action envisaged - and definitely the issue we need to address ourselves most urgently. But it is not possible to open up actual teaching work in all these 60,000 centres as follow up nor will we be able to sustain even the active centres with a single point programme of literacy alone. Health is definitely one major thrust area for follow up work in these centres. The follow-up work may take the form of health education campaigns or even of intervention in areas like immunization, guinea worm eradication etc.

Or there may be areas where we could attempt comprehensive primary health care. It is premature at this stage when the 60,000 centres exist only on paper to plan for detailed follow up. but we need to start thinking about it. We can however state confidently that the very attempt to train 60,000 voluntures to give a talk on primary health care in every village of India, is an unique attempt that is bound to throw up a major manpower resource for future health activities.

The People's Science Movements are only in embryonic stage in most of the states in India and its health work has an even smaller spread. This paper has touched on some areas and types of activities for this movement to undertake but it is by no means comprehensive or final. It is only presented as starting point for growing strategies and activities that will pool the available experience amongst health activists and PSM activitsts. We must use the opportunities presented by the expanding PSM movement, especially the BGVJ for developing a genuine people's health movement, especially the BGVJ for developing a genuine people's health movement, and we must base such a people's health movement firmly on the concept of primary health care.

Gist of the talking points delivered by Shri L. Mishra, Director General (NLM) at the Literacy Session of the Third All India Peoples' Science Congress, Vidyanagar, Bangalore on 9.3.90 from 9.00 AM to 12.00 Noon

On behalf of the Education Secretary and Chairman of the Executive Committee of the National Literacy Mission Authority - Shri Anil Bordia (who could not attend this Congress as he is away on tour abroad for the World conference for Basic Education for all by 2000 AD) and on my own behalf, I extend to you our cordial greetings and best wishes. We would like to particularly commend the energetic initiative and interest shown by the Karnataka Rajya Vijnana Parishat for convening the Third All India Peoples Science Congress at Vidyanagar, Bangalore, and for having devoted one Sub-Congress exclusively to Literacy. The subject matter, which has been assigned to me for discussion this morning is Adult Education in the 8th Five Year Plan. We are placed today at one of the most crucial junctures in the life of the National Literacy Mission (NLM) in as much as the 7th Plan period is going to end shortly, the 8th Plan period is on the anvil and the entire educational policy including the program of action (which would also necessarily include the NLM) is under review. Although it is not possible on my part to predict with any sense of arthmetical exactitude regarding the shape of events to come, I am happy to mention before you that political commitment of the Govt. to Adult Education in general and to literacy in particular has been more than reinforced by the very positive and constructive statements made by the Prime Minister, Deputy Chairman, Planning Commission and the Education Minister at the time of launching of the International Literacy year on 22.1.90 at New Delhi as also at the time of launching of a plan for complete eradication of illiteracy in Kerala and declaration of Ernakulam as the first fully literate district in the country on 4.2.90 at Cochin. To quote the words of the Prime Minister at the time of launching of ILY:

"Literacy is the very foundation for the development of the people. Universalisation of literacy must receive the highest priority".

The whole exercise for drawing up a Perspective for the 8th Five year Plan in the sphere of Adult Education began as early as July 1989. A working Group, under the Chairmanship of Education Secretary with eminent Adult Educators, educational planners and administrators etc., was constituted to undertake this exercise. The working Group constituted Sub Groups which went at great length into different aspects of Adult Education during the 8th Plan period and completed their work between July & October '89. On the basis of the recommendations of the subgroups the working group finalised its stand on the perspective for the eigth Five year plan in the field of Adult Education and submitted its report to the Planning Commission in December 1989. Although a final decision on the various recommendations made in the

Report of the working Group is yet to emerge I would like to take the august assembly into confidence to state that the recommendations were made with utmost empathy and sensitivity to the cause of providing literacy and adult education to the deprived sections of the society namely, SC ST and women, and they have also been made with total objectivity and commitment to adult education. However, before, I state some of the salient features of the perspective plan, I would like to place before you a gist of the problems, constraints and imponderables with which we are confronted in the work of the Mission. In my opinion, an objective and dispassionate understanding of these problems and constraints is most essential before we could think of translating the perspective and the strategy for adult education in the 8th Plan period into reality. The problems and constraints briefly stated are:-

During the 20s, 30s and 40s, one single call from the Father of the Nation could arouse millions of men, women and children to depth and stir them into action to fight against imposition of foreign rule. In the absence of the modern media, the Father of the Nation could successfully project imperialism as a monster and could rally around him millions of men, women and children with their undivided time, energy and attention to grapple with the enemy. The dilemma before all of us today is how to project illiteracy as a monster, which adversely affects the life of millions in the Sub-continent and how to design an appropriate strategy which would be carrying conviction to the people that it is necessary and important to be literate and which would eventually help total liquidation of illiteracy. It is a question of time, of choice of appropriate agencies, of resources and also designing the strategy in terms of the felt needs and interests of the people.

Although literal and socio-economic change are closely inter- related, it is difficult to state as to which one should precede the other. Although we all agree that it may not be possible to usher in a radical or fundamental socio-economic change in the wake of literacy programmes due to various other imponderables which have been built into the socio-economic system, it often becomes difficult to carry this message with a sense of conviction as a person, who is made literate would expect some positive incentives or benefits to flow in terms of removal of landlessness, assetlessness, enforcement of minimum wages, promotion of general well being or improvement in the overall quality of life. Our failure to ensure any improvement in the existing socio-economic system or overall quality of individuals' life does give rise to misgivings and sometime frustration about the outcome of literacy promotion efforts.

Literacy is not an end by itself; it is the tool or agent of change a change for the better, higher and sublimer aspects of human life. Literacy is not a quick-fix where instant results can be achieved or assured. This, therefore, requires lot of patience, tolerance and fortitude which may not be found with all functionaries of the programme and in all situations. Carrying convictions to these functionaries and even to the elitist sections of the society, who usually view literacy with cynicism and

scepticism, therefore, becomes a herculean task.

Equally herculean becomes the task of creating an awareness or positive understanding that literacy cannot be the programme of one Ministry or one Department or one Agency; it has to be the concern of the whole nation. Despite best efforts, we have not succeeded on driving home this truth or in carrying conviction to various development departments and agencies that they should not only adopt literacy as their own programme but as the key to the success of their programmes and should treat the illiterates as human beings with dignity, equality and respect and understand their predicament and prelections with empathy and sensitivity.

The above constraints notwithstanidng, our goal is clear and it is a desirable goal which has to be reached at any cost in less time and limited resources. It is against this background that the Perspective or the plan of action for Adult Education in the 8th Five Year Plan has been drawn up and the salient features of that plan can be enumerated as below :

The illiterates live amidst us and around us. We can find them and we have to find them. This cannot be done by mere counting of heads but by launching a process of social mobilisation. This process, which is otherwise known as conducting surveys, should help us in identifying the magnitude of the problem as also in preparing the community for literacy. Such surveys can be undertaken by all sections of the society by individuals as well as institutions but a survey can be meaningful only when we put our heart and soul into the process, only when we learn the art of talking to the people (as the late J.P. Naik often used to say). Any survey can be meaningful only when we learn as to how to talk to the people in the language intelligible to them, a process by which we can elicit the whole truth out of them, about the state of their illiteracy, about their working and living conditions, about their needs and demands of certain things in life etc.

Since ours is a vast sub-continent where conditions vary from state to state and region to region and even within the same region, there cannot be only one approach towards literacy, but a variety of approaches such as the Centre-based approach, Volunteer-based approach, Campaign-based approach etc. Once we identify the magnitude of the problem through survey, identify the uncovered area, we may draw up an appropriate plan of action which could be Centre-based or Volunteer-based or Campaign-based to bridge the uncovered gap. While drawing up the plan of action we have to necessarily take into account the culture and ethos of the people obtaining in a particular area and how exactly the literacy programme is to be implemented. Where people are unable to exercise this option or discretion for themselves due to a state of acute social, educational and economic backwardness, we have to assume this role for the people by putting ourselves in their position and identifying overselves with their joy and sorrow, their laughter and tears, their weal and woe, etc. Eventually, whatever plan of action has to be drawn up must be fully in

conformity with their felt needs, interests, preferences, ingenuity, resourcefulness and skills.

Whatever may be the nature of plan of action, the thrust in the whole approach will have to be area specific and time specific. It should be remembered that we are in a Mission where we cannot talk any longer in terms of X number of projects, X number of centres, X number of illiterate adults enrolled in the programme, but in terms of X number of persons in an area to be made functionally literate within a given period of time. We must put an end to the culture of perpetuity and ad hocism which has been prevailing so far. An area can be village or a cluster of villages or a Panchayat or a Block or even a district irrespective of the size of the area and dimension of the problem, we must aim at total liquidation of illiteracy in a given area within a given time frame as is being done in case of Kerala, Karnataka, Goa, Pondicherry, selected parts of West Bengal, Andhra Pradesh etc. The essence of area approach is that once we have selected an area, we must concentrate our total time, energy and resources in that area and should not think of shifting to a new area till the desired objective has been fully achieved.

Environment Building

Keeping in view the fact that the existing environment is not very positive and conducive to literacy, a sincere and earnest endeavor would be made to create such a positive environment for literacy in any area where literacy activity is to be taken up. This can be done by identifying good institutions which have a team of creative thinkers, writers and artists, who can design banners, posters, placards, compose literacy songs and slogans, can undertake literacy marchs and caravans and can ensure total mobilisation of the community for literacy. Generally speaking, no literacy activity should be undertaken in an area without adequate preparation and without creating the desired environment for literacy in that area.

Improved Pace & Content of Learning (IP CL)

The findings of organised research have established that all learners do not learn at the same pace. Different learners have different learning skills. We have, therefore, to take cognizance of divergent learning skills and needs of different learners and have to design a package in conformity with these learning needs and learning skills. Hitherto, irrespective of the difference in the learning skills or learning needs, we had only one set of primers whose teaching was spread over an unduly long period of one year. This was a too taxing and exacting duration where the learners tended to withdraw or alienate themselves from the process of learning. They get disinterested in the process. We have now thought in terms of a multi-graded three sets of primers which would incorporate work book, exercise book, tools of evaluation of learning, outcome and certification. This will reduce the duration of learning from one year to

about 200 hours would improve the place of learning and heighten the motivation for self-learning. In the new strategy, learning becomes more confidence based and not competition oriented, becomes result oriented and also a robust resilient and lively exercise. It is hoped that this new technique would be put into full operation during the 8th plan period.

Involvement of Voluntary Agencies

Earlier the voluntary agencies were being involved with the work of adult education programme from a restricted angle in as much as they took up primarily implementation of the Centre- based programme. The National Literacy Mission has widened and diversified the limited ambit of operation of voluntary agencies. They can take up a host of activities such as designing teaching learning materials, both for basic literacy as well as for post literacy and continuing education, training, evaluation and environment building. A host of methods for identifying agencies who are good, reliable and committed to adult education, who believe in area focus and who would abide by the norms and parameters laid down in the NLM document would be adopted and an earnest endeavor would be made to bridge the large uncovered gap by identifying such VA's in different parts of the country and getting them involved in various aspects of th work of the Mission.

Post Literacy & Continuing Education

The Jan Shikshan Nilayam is an important, innovative and institutional framework which will provide an effective linkage between basic literacy and post literacy and would also arrest the prevailing trend of relapse of neo-literates into illiteracy. This would also pave the way for life long learning for all members of the community at one focal, point. Inorder that the JSN becomes a real centre of mobilisation and environment building, awareness generation and community learning, our endeavour would be to get up one JSN in every village. Priority would be given to rural areas for selection of JSNs. Such Preraks would be selected who are naturally motivated and who have the urge, inclination and commitment to mobilise the community for literacy. They would be trained through a decentralised training mechanism. The selection of well-visualised and well-illustrated titles including science, fiction, biography, autobiography, short stories, plays etc. would be designed through a team of creative thinkers, writers and artists in a participative methodology. An endeavour would also be made to establish linkage between the JSN with the existing infrastructure for library service and efforts would be made to make available every library in schools, colleges, vidyapeeths (including public libraries where they exist) for the neo-literates.

Special strategy for SC and ST

The members of SC and ST account for 41.6 million out of 110 million illiterate adults

and 32.4 million out of 80 million. They have been victims of social discrimination and economic exploitation. They lack both leisure as well as freedom for literacy in order that adult education becomes a tool of their need perception and need internalisation or conscientisation. The strategy in the 8th Plan period should be of direct interest and relevance to their lives in terms of location, content of materials, training feed-back, evaluation etc. Eventually, the entire programme must be directed towards their empowerment, their objective understanding of their own situation, of their strength and weakness vis-vis strength and weaknesses of the forces surrounding their lives so that it leads to their effective participation in the affairs of their family of the society and of the nation at large.

Adult Education as a tool of women's equality and empowerment

Alike in the case of members of SC & ST community the whole adult education programme in terms of location, content, flexibility in timing, training, feed back and evaluation must be directed towards the equality and empowerment of women. The taboos and mistaken notions that women are inferior to men in ability to work in productivity and in quality of work must be removed at any cost and the positive perception that they are as good, as intelligent, as capable and as hard-working as men, must be driven home and reflected in all our adult education materials, training programmes, evaluation programmes so that these programmes also become tools of liberation, equality and empowerment of women. The materials must carry the message with conviction that women in matters of food, dress, dignity of labour approach to life and as an integral part of the society are entitled to the same treatment as men and no development can be completed without making them effective partners thereof.

Media and Communication

The media and communication strategy - both traditional and non- traditional, must liberate itself from the consumerism, monetisation and immediacy in terms of material gains and must be based on a content and process which are positive, which are ennobling and sensitising. The programmes must also be appealing, imaginative and soul-stirring. The software must come from the people at the grass root level. The neo-literates must be given a pride of place, in the entire process of fixing the media and communication strategy and their cultural energy and creativity must be tapped through media. Repetitiveness should be the catchword. Anything be it a song, or a slogan or a success story which is appealing and which leaves a telling impact on the minds of the people must be repeated. The media messages must be inexpensive, must catch the imagination of both literate and neoliterates and must be linguistically relevant for the region. Electronic media may supplement the print media to some extent but cannot be construed to replace the print media by any stretch of imagination.

Technology Demonstration Process

We should not understand technology in the context of the National Literacy Mission merely in terms of a good lantern or a good petromax light or solar power packs or improved blackboard or improved slate or chalk or duster or eraser but in terms of tools and techniques of teaching and learning which are imaginative, lively and appealing and which can carry the message across in an easy and effortless, natural and spontaneous manner. New tools and new methods of learning which would encompass designing bill- boards, exhibition boards, human anatomy for teaching biology, computer graphics for learning etc. need to be designed in a manner which makes them inexpensive and yet totally in conformity with the learning needs of the community. There is need for identifying and harnessing the talent amongst the members of the scientific community in designing and patenting all such innovative tools of learning.

SCIENCE AND THE PRACTICE OF LITERACY

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Literacy has been looked at sociologically and historically as an enabling factor that helped in the rise of the modern scientific tradition. For, writing made accessible certain tools of intellectual operation associated with the Greek notion of formal logic, like contradiction, skepticism or inference, which supported the development of science. For instance, the presence of documents allowed the possibility of laying side by side different accounts, emanating from different sources at different times, to perceive contradictions or inconsistencies which, in the oral mode, could remain unnoticed. Writing made possible a kind of critical attention to the text which led to the enhanced capacity for explicit articulation. For oral communication is intrinsically situation - bound and depends mostly on face- to face interaction which assume implicit shared meanings between the speaker and the listener. Indeed, all meaning is not invested in oral statements alone, for a host of non-verbal factors contribute toward defining the context of communication. Thus, whereas morality ensures an empathetic and communal identification with what is known, writing distances the knower and in this process sets up conditions for 'objectivity'.

Literacy and 'objectivity in Science

The emphasis on 'objectivity' in Western Science has been traced by Olson[1] to the awareness of critical distinction between statements or texts on the one hand and their interpretation on the other. He notes that in pre-literate societies there is little recognition of ambiguity in utterances: it is assumed that interpretations arrived at by the listener are actually intended by the speaker. Oracles and prophecies are thus found to be successful by virtue of their ambiguity: the more ambiguous the oracular pronouncement the less liable it is to fail. Pre- literate societies tend to view eventual happenings, taken as fulfillment of the oracle, as having been intrinsic in the pronouncement itself. For, no distinction is made between what the oracle said and how it was interpreted by the listener. Indeed, even young children of highly literate cultures, who have not yet been initiated into a 'literate' discourse - a discourse which provides a metalanguage, or devices for referring to words, sentences and their meanings - are found to be unable to distinguish between what a person or text says from what it means. On hearing stories in which a character seems to cause confusion on account of an ambiguous utterance, young children failed to hold the speaker responsible for the failure in communication, but instead blamed the listener. Similarly, these children also could not dinstinguish between what they saw from what they already knew. This distinction between the given and its interpretation is seen to depend on a person's awareness of the existence of subjective mental states in oneself or others. And it has been suggested that this is a 'literate' distinction in as much as the recognition of one's subjectivity is related though indirectly, to one's participation in and exposure to literacy practices.

Indeed, the absence (or weak presence) of the given vs. interpretation or the 'say vs mean' distinction can be appreciated by looking carefully at how oral cultures reproduce or memorise information, orality places little emphasis on exact recall and the act of reproduction normally takes the form of "creative reconstruction" which does not involve verbatim memory or limitation but takes report to "recall richly" and imginitive reconstruction through the subject's own preconceptions. In fact, this process has been considered the very basis of much creative 'oral' literature. When the art of recall itself implicity incorporates scaffolding by the subjects own interpretations, then for an oral narrator the distinction between a statement and its meaning would appear rather incongruous. For him, the very act of narrating is tied to giving meaning to words. This, of course, does not deny that oral cultures do preserve some standardised forms which have been exactly memorised, though much investment is made to commit them to memory through complex mnemonics and specialised techniques of recitation. Indeed, as emphasised by Narasimhan[3], the Indian tradition though predominantly an oral one. functioned within a 'literate' framework with highly evolved mnemotechnics developed to preserve the complex performing - art forms. The highly structured oral notational 'bols' for tabla playing or the elaborate grammatical rules to orally transmit the Rigvedas in its preserved 'textual' form are examples of such literate props or mnemotechnics devised in the absence of tradition of writing.

Documenting the increased use of writing for the purposes of law, technology, philosophy and science in the Middle ages, Stock[4] shows how literacy contributed to certain conceptual distinctions made between facts and interpretations. For instance, in the early periods, even dreams, prophecies and visions were used as important evidence against an accused criminal. But as literacy prevailed in court procedures the text - vs - interpretations distinction led judges to view facts as something objective whereas interpretations were seen as subjective, personal and invented. Olson traces this distinction to be of crucial significance for the emergence of two social movements - the Reformation and the rise of modern western science. The voice of Reformation, as expressed by Luther, had drawn a sharp distinction between what was "given" by the Scripture and the interpretations of the text. In fact, he denied all spiritual and moral meanings ascribed to the text by the Church. For him only the literal and historical meaning was intrinsic to the text: the rest was all 'tradition' and 'dogma'. He insisted on the autonomy of the Scripture, saying it needed no interpretation, it needed only to be read. A century later, the same metaphor was carried over by scientists who insisted on the autonomy of what was given in the 'book of nature', to be read by anyone with faithfull objectivity. All factual observation were looked upon as 'objective' readings of the 'book of nature' and were distinguished from subjective interpretations, hypotheses or inferences. Indeed this distinction was taken as absolute in the 17th century and only in the present century has it been completely relativised in view of a better understanding of the epistemology of science on the one hand as well as the processes of perception, congnition etc., on the other.

As science continued to work towards greater objectivity and personal disengagement, its discourse increasingly sought unambiguity and universality. Its terminology became finely differentiated and precise definitions were devised. For instance, as concepts in mechanics developed, 'movement' was gradually differentiated into a spectrum of precise and unambiguous terms like velocity, speed, momentum intertia, kinetic energy etc. An elaborate vocabulary was adopted from Latin and ordinary language was specialised to make it a precise tool for the unambiguous expression of fine-grained explicit meanings. In fact Spart[5], the historian of the newly formed Royal Society of London, is quoted to have remarked that the Society was concerned with both the improvement of science and the improvement of English as a medium of prose". Indeed even today most of the verbs thus incorporated into English (like assume, interpret, infer, contradict, observe, predict etc.) still continue to comprise the discourse of only the literate standard English, not being used for common oral communication which relies mostly on words of Germanic origin (like believe, think, understand, know, mean, say tell etc.) However, it is pertinent to note that in Hindi (or the other Indian languages) the equivalents of such Latinate or epistemic verbs are not as prevalent today even in the literate form of the language-literal translations do exist in dictionaries but are not a part of the standard discourse.

The attempt in science to formulate explicit public statements with rigorous attention to logical, causal or chronological relations has led to the literate 'transactional' form of language as opposed to the 'expressive' form used normally in oral communication. A Child's language too is most expressive and therefore 'subjective', focussing a good deal on the speaker and relying heavily for its interpretation on the specific context in which it occurs as well as upon the listeners' knowledge of the speaker's situation. But science texts, unmindful of children's natural language, tend to adopt a transactional mode, with a disembodied, decontextualised and detached tone, and therefore fail to engage them personally. For those of us involved in science education it is of prime importance to ask why the lierate transactional form imposes on school children the requirement that science experiments or observations be recorded in an expressionless, impersonal expository style? Why can't a child be encouraged to adopt a more personally involved and subjectively 'oral' mode of recording her experiences in the classroom, be it her excitement in a chemistry experiment on seeing the bright pink colour suddenly disappear or her disgust on sensing the horrible smell of a pungent gas. For, it hardly needs to be stressed that the subjective expressive form of language is close to the self of the writer. A shift towards the literate mode should be gradual enough to ensure that the 'self' though hidden, is not lost on the way.

Orality and the organisation of knowledge

For a long time cross cultural research into the workings of the oral or non literate mind, being patiently ethnocentric and often unsuspectingly polarised by the cultural spectacles of the observers, had characterised it as 'primitive' or inferior to the literate mind. It was held that non-literate cultures possessed a mind that typically lacked in abstract and analytic though

and was incapable of inferential reasoning. However in the last two decades there has been a considerable shift in this stand; more interpretive studies which positively attempted, in Gretz's words, "understand how it is we understand understandings not our own"[6] have been undertaken and significant insights about the process of oral congnition gained. Luria's work with the semi-and non-literate peoples of Uzbekistan and Khirgizia emphasises that abstract, decontextualised conceptual thinking is a reflection of a society's cultural and intellectual history conveyed through its linguistic system. For instance, studies on categorisation, or the way people group things and make generalisations, revealed that non-literate subjects invariably restored to 'situations' thinking and classified objects according to their real life relationships. This functional - graphic perception based on practical experience was so overriding that even the suggestion of other abstract principles to guide classification was persistently dismissed as irrelevant or 'stupid. A typical example is that in which non-literate subjects, on being shown drawings of hammer, a saw, a log and a hatchet, insisted that they all belonged to one group and that none could be excluded. "They are all alike. The saw will saw the log and the hatchet will chop it into small pieces. If one of these has to go, I would throw out the hatchet. It does not do as good a job as a saw".[7] On being told that another subject has placed the three things - hammer, saw and hatchet - together keeping the log out, one peasant promptly replied, 'Probably he's got a lot of firewood, but if we will be left without wood we won't be able to do anything'[8]. They further insisted that wood too could be called a 'tool' since handles of tools were made from wood, and so were poles and other things. They asserted indignantly - 'we call all the things we have need of tools' we have a saying: take a look in the fields and you will see tools' - thereby defining the essential practicality of the modes of generalisation they used.

Other studies in Third World countries show that it is not as if rural children cannot use abstract or superordinate concepts for classification, regarded as conceptually preferable in school systems, but that they choose not to do so because such concepts do not satisfy their modes of organising experience. A sensitive example is that of a twelve year old peasant child from Mexico, who when asked to categorise various objects on the basis of their similarities, almost poetically refused to place them together by stating that the 'banana is like a horn, the orange a ball and the bean a little heart, they are not alike.'[9] This imagery, embedded as it is in the child's living experience of perception, is strikingly similar to the kind exhibited by children in oral riddle games.

The capacity to logically connect two different statements and draw a conclusion from them as in syllogistic reasoning, was for a long time considered basic to human consciousness. For example, if we are given the two propositions 'Precious metals do not rust' and 'gold is precious metal' we can almost unthinkingly conclude from them that gold does not rust. Piaget had raised questions about the "naturalness" of such logical operations in his studies related to the intellectual development of children. However, Luria, in his work with non-literates had attempted to determine whether or not such logical schemes are invariant at different stages of social history and social development. He found that subjects

who could draw excellent judgements about often complex facts of direct concern often failed to perceive logical relations between the premises of a syllogism, which was a form of abstract reasoning alien to them. As an illustration, Let's consider the following famous example: "In the Far North, where there is snow all bears are white Novaya Zemlya is in the Far North and there is always snow there. What colour are the bears? To this one person revealingly replied: "I don't know. I have such a black bear; I have never seen any others . . . Each locality has its own animals" and on being pressed further, he resorted, locality has its own animals", and on being pressed further, he restored almost exasperatedly, "That's my last word. Those who saw can tell, those who did not see can't say anything" However, the response of a semiliterate volunteer, ostensibly keen to absolve himself from the personal responsibility of assigning a colour to the unseen bears, was, typically "To go by your words they should all be white' Thus the responses, reflecting a mistrust of the initial premises which were removed from their immediate experience, categorically refused to personally commit to any 'objective' conclusion. Moreover, a bare brush with literacy (especially of the kind associated with schooling) could apparently, make theoretical modes of generalisation more accessible, if not entirely acceptable. The rules of the game became more apparent, even if the game was not wholly satisfying.

Indeed as Long [10] points out, a syllogism is like a text-fixed, self contained and isolated - its conclusions are derived from its premises only, without recourse to personal interpretation. The riddle, on the other hand, symbolises a mode of reasoning which belongs to the oral mind, demanding resources of knowledge far beyond the words themselves. Many of us have seen how even young children love to indulge in complex riddle games - relishing the act of stretching their imagination, stretching their memory and maximally taxing their inferential abilities.

A recent observation from a science classroom in a government school of Dhar (MP) where, as part of the Hoshangabad Science Teaching programme (HSTP), children of class 8 were most actively performing experiments with various floating objects and trying to balance the weight of the object with the weight of the water it displaced on floating. They were required to draw a collective table on the board and see whether in most of the experiments the two weights came out equal or unequal. The next question in their workbook (leading them towards the Archimedes' principle) asked them if from their results they could say how the weight of a floating body was related to the weight of the water it displaced. And this is where they all got stuck. They looked most quizzically at each other and at their teacher. What did the question mean? The teacher (An extremely friendly and unusually motivated person) tried to simplify the question in less generalised and somewhat more concrete terms: (What is the relationship between the weight of this ball and the weight of this water it has displaced? Still no response, only puzzled expressions, even from the most articulate students. The teacher then tried to use a simpler word for the term (relationship) saying? Much to our surprise, most girls began to snigger and amusedly repeated the word 'relationship'. Because it is also used in the context of a matrimonial proposal. As it turned out, looking at the

'equality' of the two weights in terms of a 'relationship' was conceptually and linguistically peculiar for them: they had performed the experiments, knew that each object weighed the same as the water it displaced, and yet the abstraction of their experience in our terms was not very natural and satisfying.

The tradition of orality makes certain modes of organising experience more accessible viewing other decontextualised systems as inexplicable and unnatural. For science to understand the depths of oral sensibilities, it would need to review its own communicability, making its discourse more transparent to different modes of thought and associating itself more closely with specific cultural practices of literacy.

The practice of literacy:

While looking at the cognitive consequences of literacy one needs to clearly differentiate between two processes: one, the cognitive transformation of a society over the course of its cultural and intellectual history, and second, the effect of literacy on individuals in present day societies. Much controversy and confusing has stemmed from the failure to distinguish between such processes. In trying to study the effects of literacy on individual members of the Vai Community in West Africa, Scribner and cole [11] further distinguished between 'schooled' and 'unschooled' literacy, insisting that formal schooling itself provides a decontextualised framework and promotes certain intellectual skills that call for abstract reasoning. Their work with unschooled literates, who had knowledge of the indigenous Vai script, invented some 150 years ago and transmitted from one generation to another without schooling or professional teachers, provided a unique opportunity to investigate the unmediated effects of literacy. Initially it was found that Vai literates were not significantly different from non-literates on any of the standard cognitive measures of reasoning used by developmental psychologists. However, after one year of fieldwork Scribner and Cole changed their strategy; instead of working down from development theories they began to work up from field observations to see how literacy was socially organised by the Vai. Since better-writing was the most common use of the Vai script they closely studied its consequences and found that men-literate in the script were indeed far superior to non-literates in their ability to achieve explicit and unambiguous communication in limited laboratory experiments - they could give explicit descriptions of various tasks (like the rules for playing a simple board game) for someone far removed. This study provided the first evidence that certain literacy practices produced intellectual outcomes closely tied to those practices and that skills involved in literacy behaves may indeed be transferable to behaviours unrelated to literacy. It follows that the mere act of reading and writing cannot be expected to produce the range of desired intellectual outcomes normally considered characteristics of 'schooled literacy' -- specific literacy practices, closely linked to the social and cultural lives of people would need to be actively engaged to foster specific skills. Moreover, the skills available for learning to read and write need to be assessed with respect for oral 'accomplishments' like complex riddle games, hypothetical reasoning and oral narrative. Similarly science communication and education

seriously needs to address and explore different literacy practices within the predominantly oral universe of our people in order to effectively foster requisite 'scientific' skills. Moreover, it would be imperative to design 'memorable' mnemonics that help in committing to memory certain essential mechanical elements of a scientific task like plotting a graph, for example. In the HSTP, the graph is introduced to children aged 13-14 years after they have played around sufficiently with concept of grid using it to plot animal figures, reducing and enlarging figures to a given scale, etc. Despite that, one finds that the mechanics of drawing or interpreting from a graph normally presents difficulty in explicit articulation - even children who might be able to perform these tasks find it difficult to explain the procedure to others, and subsequently to commit it to memory. Interestingly, this is similar to the experience of 'kolam' (or rangoli) practitioners who draw the highly complex and beautiful folk-art patterns, using a grid of small dots as a base. Siromoney[12] has shown that although the performance of this skill engages complex grammatcal rules, the practitioners most of there non- literate, are themselves unaware of those and are unable to articulate the strategies they adopt. What they are aware of are the mnemonics or constructional aids which help them to construct the patterns stage by stage in a manner typically conforming to the natural segmentability of the design. According to Narasimhan, the Indian tradition has coped with the orality of its craftspersons with admirable sophistication. The more abstract and theoretical the rules and principles governing a craft technique and the less literate its practitioners, the need for translation of those principles into practice made it highly imperative for clever mnemotechnics or ingeneous literacy groups to be devised. A systematic study and suitable extension o such "underpinnings of orality by literacy" would also help in devising appropriate instructional methodologies for the teaching of science.

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PONDICHERRY - THE ARIVOLI EXPERIENCE

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'Arivoli' - meaning **'Gnanajyothi'** is the name we have given to our mass campaign to eradicate illiteracy in the Union Territory of Pondicherry. The aim is to totally eradicate illiteracy in the Union Territory by the end of 1990. This paper seeks to set out in brief, the salient features of the mass campaign, its strategy, the experience we have gained in the past few months, and an analysis of the strategies we have adopted.

The Place; Pondicherry is an Union Territory consisting of former French Establishments in India, comprising of Pondicherry and Karaikal, Mahe and Yanam. Pondicherry and Karaikal are on the coromandal coast south of Madras and together constitute the largest part of the territory. They are separated by about 132 Kms. and the Mahe, an area 8 Kms in size, is enclaved in North Kerala in the Arabian Sea and is Malayalam speaking while Yanam is near Kakinada in Andhra Pradesh, 20 Sq.Kms in size with Telugu speaking inhabitants. The literacy rate (1981) is 55.85% for a population of 6.04 lakhs. Female literacy being 45.71%, with the Pondicherry region having 54,59% Karikal 56.43% Mahe 74.11% and Yanam with 49.57%. Overall, the territory ranked 6th in India for its literacy rates. The real picture however reveals a wide variation from among the highest literacy rates in the country in Mahe, right down to very unexceptional literacy rates in Yanam.

The Sponsors: The project proposal was put up by Dr. T Sundararaman, Vice President of the Pondicherry Science Forum to the Education Department. The Pondicherry Science Forum has been doing excellent work in Pondicherry schools for the past few years and the track record of the organisation helped clearance of the project by the Government of Pondicherry. It called for the active participation of the existing adult education animators together with the Pondicherry Science Forum activists forming the motivated core group. The NSS operating in educational institutions were to be involved along with the Nehru Yuvak Kendra in Pondicherry.

The Plan: The plan is quite simple. It was estimated that the Union Territory hard approximately 1-1.5 lakhs illiterates. These would be identified by a census which would be computerised. Teaching them in batches of 10, over a 180 hour period, we required a 15,000 strong volunteer army. Working backwards, we needed about 1,000 organisers to instruct, guide and follow up on the volunteer army. These would come from the 700 odd adult education animators of the Education Department and another 300 volunteers drawn from all sections of society and also the Pondicherry Science Forum, the NSS and the Nehru Yuvak

Kendra. 300 Master Trainers would form the core group to train up the 1,000 organisers. Special attention was to be given to the mode and content of training and spread over the entire period of the campaign. We planned about 40 camps for the training of the volunteers and organisers. A special syllabus for literacy, numeracy and functionality would be designed in line with the IPCI, (Improved pace and Content of Learner) Norms of the National Literacy Mission.

To bring both teachers and learners into the campaign, a publicity blitz was planned. This could include mass media like Radio, newspapers pages, Banners, **Stickers,** Slides and also a form of Street Play or Jatha. Several intense publicity compaigns were planned just before the teaching phase. For about 10 days, the Arivoli message would be carried to every village and street in the Union territory. An enrollment campaign would go on simultaneously and the teaching phase would begin. Teaching would be for about 2-3 hours per day, 3-5 days a week depending on the learners inclinations and conveniences. Each volunteer would be responsible for teaching 10 illiterates. At the end of 4 months, all those made literate would launch a literacy celebration Mopping up operations would be launched in areas where the campaign had not fully succeeded and by November 1990 it was hoped that it would be possible to declare Pondicherry as the first totally literate State/Union Territory in the country.

The Organisations: A separate organisation was to be set up to implement this project. The Puduvai Arivoli Iyakkam (Pondicherry Arivolu Movement) was set up under the Societies Registration Act. It has a Governing Body, six of whom are from Government and five from the voluntary sector and an Executive Committee and an office to carry out the work. Sub-committees were set up at Karaikai, Mahe and Yanam. They are headed by the Administrator, the Chief Government official of the region.

Serparate Sub-Committees were envisaged for women, publicity, Jatha, training and have pace set up. On the field, each village was to have a village organiser whose job it was to find 15 teacher volunteers to teach about 150 illiterates. The village organisers were to be helped by village level committees, whose main activities would be to ensure that the illiterates attended the classes, and also to provide help in setting up meetings, and arrangements for Jatha etc., Several village level organisers would have a Commune Level Organiser a Key person who would follow up and guide the village organisers. He in turn would be assisted by the Communue Level Committees (a 'Commune' is a sub-division of our region, a remnant of French rule) consisting of notable voluntary workers and commune-level Government officers like Block Development Officers etc. These commune level organisers would keep Arivoli headquarters informed of developments. In addition to this, direct feedback could be received from organisers and volunteers when they meet at the teaching/training camps.

Government as an active and integral partner: Essentially the Arivoli plan follows the Kerala Shastra Sahitya Parishad's Ernakulam project model., The Arivoli proposal also

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fortunately coincided with a phase of retrospection by the Education Department of its own Adult Education programmes. The implementation of the programme was being tightened and made more campaign oriented. The proposal was thus seen as a logical extension of steps taken earlier and hence readily accepted. However Arivoli differs substantially from the Eranakulam model in that the Government Adult Education wing is fully involved and viewed as an integral part and infrastructural core of Arivoli.In fact our main thrust initially was to bring the Adult Education cadre round to the mass campaign way of teaching and most importantly of achieving the objective of teaching all illiterates within a time frame. This was not an easy task accustomed as they were teaching a certain number of learners every year with no major publicity support or monitoring: with no end in sight to the flow of illiterates. Apprehensions were raised about the prospects of their jobs once illiteracy was eradicated. We have also had a number of resignations from those who found the work- style not to their liking. However, after a while they have thrown themselves into their work and some good leaders have emerged. All this took a lot of discussion, training and intensive person to person interaction with the Pondicherry Science Forum activists.

Arivoli, therefore represents an effort to integrate Adult education animators into the campaign as vital partners. Adult Education Project Officers are part of the Executive Committee; coordinators of commune level have taken the task of writing out the primers. The bringing of adult education workers into the campaign must rank as one of Arivoli's significant achievements. This is because adult education workers in the Project Mode whether in Governmental or non-Governmental organisations tend to look on mass campaigns as an indictment on the quality of their prior work. This is a problem that will have to be faced as more and more mass campaigns become the rule around the country.

IMPLEMENTING ARIVOLI:

1. The Survey: This was planned before the mass campaign was envisaged. The Union Territory was due for a ration card census conducted by the Civil Supplies Department. Adult Education animators were to do this and they would note down the literacy levels of each and every person in the Union Territory. This would go into a computerised database making it easy to identify illiterates for the village level committees, to ensure that they attended classes, and to evaluate their progress after the teaching phase. The Survey started on 15th August 1989 in Pondicherry and Karaikal. The Mahe and Yanam regions do not have adult education animators and there the Literacy Survey was not carried out along with a ration card census. Census was completed by October end and the computerisation of information was carried out by a team of 40 data entry operators working 12 hours a day in four Higher Secondary Schools under a team of school teachers headed by group of Higher secondary school Computer Instructors who had worked out the software and the logistics of this massive operation. Results were out towards the end of December and the printouts were given to the village level volunteers. They took these lists as part of the 'Meet the illiterates' campaign. Volunteers would go to houses, talk with the illiterate about Arivoli and enquire if there were

more illiterates. By the end of January 1990 most of the areas had been covered, but now it was a different story. Volunteers reported that many families had exaggerated the size of their families giving fictitious names to increase their ration and indicated these non-existent persons as illiterates. In some areas this over reporting was as high as 10% to 20%. Recourse to the electoral rolls also revealed the same trend. A lesson very forcefully given home was that literacy surveys should not be linked with any kind of survey that would ultimately convey economic benefits like rations, poverty alleivation schemes or even votes. However, the computerised list was useful for door to door location of illiterates and helped to identify some persons who did not have ration cards. They will still be useful for monitoring and evolution.

2. **Jatha:** It was decided early in a campaign (Sept. '89) that a pilot project was necessary to test the efficacy of the Jatha. Inherent in our jatha concept was that the village which was visited should bear the expenses involved in setting up the stage lights, sound etc. and provide a meal for the troupe after the performance. This last aspect was considered important since it would create a bond between the villagers and the troupe. This meant setting up Jatha Organising Committees (JOCs) which would have to mobilise the villagers. We drew up an itinerary for the Jatha troupe; identified a volunteer in each village, mostly a school teacher/headmaster of a school and gave him a list of youth clubs, anganawadi workers and adult education animators working in the village. A simple manual was drawn up for volunteers and for the JOCs.

The Jathas were put together in a 7-day script production camp in which theatre persons from Madras and the Pondicherry University School of Drama participated. A repertoire of plays, action songs and dances were put together. A further 10 day residential training camp for the troupe followed and immediately thereafter the jatha programme was launched from 10th October to 24th October 1989 in 66 places in Pondicherry and Karaikal. The group played before schools, colleges, villages and city streets. It was a resounding success in terms of the rapt attention given to the programmes by about 40,000 people particularly in rural area. Equally gratifying was the fact that in most places the JOCs worked very well with the public contributing generously. We estimate that about Rs. 60,000 came from the public. We had not received our funds from the NLM then, but banks came forward to finance posters and transportation costs. Many of these JOCs have now become the village level committees and have thrown up many more volunteers and resource persons. The 'Pilot Jatha thus was a great success and has helped us in clarifying out thinking on the jatha and local committees.

3. Syllabus: The prelude to the framing of the syllabus was a brainstorming session by the Executive Comm tees. It was decided to work within the NLM norms and to build up a primer containing literacy and numeracy components with adequate space in the primer itself for writing, practice and testing. The Tamil Nadu primer with some modifications and the Ernakulam type of functionality primer was felt adequate. Introduction of letters and numbers would be a priority followed by reading practice and writing. When a reasonable fluency was

reached, the functional literacy package could be started and the primer would start off with a series of 10 pictures which would form the basis for discussions and the introduction of key words and alphabets. The primer was written out with the assitance of the State Resource Centre. A 7 day workshop with artists from Madras and Pondicherry prepared the illustrations for the primers in mid February., Printing should begin this month and books ready for delivery in May. Mahe and Yanam will follow the Kerala Shastra Sahitya Parishad and Andhra Pradesh primer respectively.

4. Training. This is a critical area in any mass campaign since only proper training can ensure that key concepts are carried down to the 15,000 volunteers without any transmission losses. Our original plan was to have about 300 master trainers and use them train 1,000 organisers who would in turn train 15,000 volunteers. However a major shift in thinking came when we realised that 300 master trainers could themselves be the village level convenors. This would reinforce the training at the village level and help mid course corrections during teaching phase. Master trainers would be highly motivated and they would be in a position to endorse that teacher volunteers were doing their work as planned. A core group of 30 persons, actively involved in the planning and implementation of Arivoli were trained as key Resource Persons and they in turn trained 300 master trainers in January 1990. These persons have now mobilised about 400 odd volunteers from the field and they have been trained a few days ago. Separate 3-day camps are on for adult education animators who also had an earlier spell of training. The 15,000 volunteer army are proposed to be trained in batches of a 1000 each in schools during the summer vacation.

5. Sub-committees: The sub-committees on women, Jatha and publicity have been set up. It has been realised that much of Arivoli will concern illiteracy among women. Mobilisation of women is a priority in Arivoli and the Women's committee has been working out strategies to reach Women. These include contact programmes for college students, anganawadi and health workers, and the positioning of a woman in every village level committee as Co-Convenor.

6. The Path Ahead: We have had 2 elections in November and February which hampered active field work. We concentrated instead on planning and training during these two months. Now that elections are over, the grass root level has to be activated. The village level convenors and their committees are being asked to organise village conventions throughout Pondicherry and Karikal on March 18th. This can consist of a procession or Jatha but will culminate in a meeting where the programme will be discussed among villagers and plans made to achieve 100% literacy in the village itself. The convention will also nominate a woman member who will represent the women of the village at the State Level Women's Convention on 1st April, where plans to mobilise women will be finalised. Enrollment of volunteer for the 15,000 army will commence from the 18th of March onwards. On April 8th representatives of village committees will meet in 13 commune conventions. This will heighten awareness of the campaign in every village in Pondicherry.

The literacy Festival will be the climax of the climate building exercise. This time we plan 10 jatha troupes. Starting on April 27th the festival will continue for 10 days. The troupes will perform in every village/area once. For the remaining 9 days the village committee is to have debates, plays, story-telling, etc. to keep literacy the live topic. Simultaneously a mass media publicity campaign will go on through newspaper advertisements, cine slides poster and banners, radio and television. The 10th day of the literacy festival will see a state level convention with representatives from all villages pledging to wipe out illiteracy in their areas. The training of the 15,000 volunteers will begin and will be completed in 4 waves between 11th May and 21st May. Teaching will begin also in 4 waves and should continue for about 4 months.

We will take stock of the situation after the teaching starts at the end of May to see if any corrections are needed.

Arivoli's Lessons so for: In conclusion, the Arivoli experience thus far has been rich and rewarding. When we started with the proposal in one hand, it seemed an impossible dream to get the Rs. 81 lakhs required for the project. The response of the National Literacy Mission was swift. Even before the financial assistance reached us we had organised training camps and carried off on excellent jatha programme and the response of the people and local organisations surprised us. We have now about 700 workers right from 8th standard drop-outs to M.Phils, united in a common purpose. What we have learnt could be summarised as follows:

First, that it is possible with a band of dedicated people in the Pondicherry Science Forum, to overcome very many difficulties and carry out an incredible amount of work in a short time.

Second, it has been an eye opener to bureaucrats like me as to what ordinary people can do, if we believe in them, listen to them and ask them to make decisions and take responsibility for them.

Third, it has been possible to reactivate the Adult Education Wing of the Government of Pondicherry. Animators now attend to their work with a sense of purpose and new found self-esteem.

Fourth, the energies of young people released for productive purposes is tremendous. The energy, total dedication and discipline of our father members had to be seen to be believed.

Fifth, detailed planning is necessary and indeed crucial for success. However, we should be able to admit mistakes candidly and make changes whenever necessary.

Sixth, governmental involvement in major way in mass campaigns need not be a bad thing. In Arivoli's case, this had made possible men, infrastructure and specialised skills like financial management available to the campaign. Government should act as a facilitator of such activities, while in its implementation in the field its role should be underplayed.

Seventh, Arivoli has given confidence to its volunteers in their own abilities.

Finally, Arivoli has given to all of us, whether in Government or outside, an understanding of the nexus between literacy and development an empathy for the illiterate and the confidence to attempt to help people change their own lives.

RELEVANCE OF PSM EXPERIENCE

R. Radhakrishnan
K.S.S.P.

The emergence of People's Science Movements (PSMs) is comparatively a very recent social phenomenon in India. They are steadily expanding their activities and gradually stabilising their role in society. The past experiences and activities, undertaken by them, have already set their objectives in proper perspective. They seek to "Popularise Science and the scientific attitude among the people, to arm them and their organisations with science to mobilise people against abuse of science, to campaign for alternatives that are more in conformity with interests of the people and to agitate for the development of self-reliant Science and Technology for the nation".

The main emphasis of their activities is to use newer and newer communication tools in such a manner as to enable the people to secure for themselves the most fundamental of the fundamental rights-the right to know. It is not enough to help them to secure the right to know mechanically but to make them capable of using that knowledge in their day to day life too. The right to know, as the fourth International Adult Education Conference rightly opined includes,

"the right to read and write,

the right to question and analyse,

the right to dream and to do creative activities,

the right to write about one's own life and to formulate one's own history

the right to get education, and

the right to achieve individual and collective talents".

But the attempt of the PSMs to fight for the people's right to know fully and to create a scientific temper is severely constrained by the existence of wide-spread illiteracy in our society. In fact, an important single objective factor impeding scientific temper in India is illiteracy. Reading and writing, is an important factor in understanding the world and developing a scientific world outlook. Literacy gives people independent access to what happened long ago as well as to what is happening far away. This continuous spatial and temporal widening of outlook is an essential ingredient of scientific temper. Without literacy, this is not possible. Unfortunately in India the number of illiterates is mounting day after day despite an increase in rate of literacy. In the fifties the number of illiterate people in the country

was a little over 30 crores. After the last census in 1981, the number has touched 45 croes. At this rate, the number of illiterate people at the end of this century is expected to be 50 corers. If the various people's science groups want to make any advance in the achievement of their objectives, this condition must change.

At the time of formulation of the constitution, the necessity of eradicating illiteracy from the country was fully visualized. But the only strategy adopted to make the people literate has been to place an exclusive emphasis on the development of a programme of free and compulsory education for all children till they reach the age of 14 years.

Article 45 under Directive Principles of State Policy in the Indian Constitution states thus: "The state shall endeaviour to provide within a period of 10 years from the commencement of this constitution for free and compulsory education for all children until they complete the age of 14 years". But the stark reality is that the problem has remained till this day and is now of a higher magnitude.

Not that there were no efforts made. In fact from 1947 onwards several agencies-both governmental and non-governmental-carried on work for the eradication of illiteracy through such programmes as Adult Education Programme, Rural Functional Literacy Programme and Mass Functional Literacy Programme.

But despite all these programmes and activities of individual organisations, the monster of illiteracy has been growing bigger and bigger. It is possible that the determination and sincere commitment on the part of the agencies-whether governmental or non-governmental-in implementing the programmes in their letter and spirit was not adequate. In spite of the governments' repeated admission in several documents that it failed miserably to implement any programme in this direction effectively and fruitfully, no concerted and whole-hearted effort had been initiated by the Government. What is the net result ?

The teaming millions of illiterate people do not have any effective say in the matter of developmental activities of the country, even though they contribute their share in the creation of nation's income and wealth. Participatory democracy has become quite meaningless for them. They are silent spectators in the so called democracy and are exposed only to the husk of democracy while the sweet kernel of it is enjoyed by only a chosen few. As far as the vast majority of the people are concerned democracy is a government off the people, to buy the people and far from the people.

The type of development, and the participation of the majority of the people, leads to a process of immiserisation on one side and the enrichment of the minority on the other side. The feudal forces and the fundamentalist elements find this country, with millions of illiterate people, a fertile land for exploitation, profiteering and disruption. Their combined and coordinated efforts accelerate the process of immiserisation of the majority of the people. Again more and more people are coming under the threat of immiserisation. The

reorganisation of society in order to reverse the process of this immiserisation and enable every citizen to lead a full and rich life is the social revolution, visualized by the PSM. If science should become a weapon in the hands of the people and their organisations in their struggle to reverse the process of immiserisation, literacy must be a prerequisite. Under these circumstances, the PSMs themselves have to enter into the activities for eradicating illiteracy.

KSSP which is striving to develop a PSM in Kerala mooted the idea of total literacy in Kerala within five years, in November 1985 during a national workshop on "Challenge of Education". Later, in the next year, a draft project, to make Kerala fully literate, was submitted to the Union Ministry of Education. But it was not approved. This was before the establishment of the National Literacy Mission (NLM). Last year through a massive literacy campaign - "lead kindly light"-Eranakulam district of Kerala State, has achieved the distinction of being the first fully literate district of India. "Lead kindly light" is a project entrusted to KSSP by the National Literacy mission. Of the 25 lakh people between the age group 5 to 60, in the district, 98.5% are today literate.

Once KSSP decided to take up the project, it reviewed all the previous efforts made by various agencies in the country, to find out why those attempts could not be successful. The following were the conclusions: (a) There was a lack of political and social will in the attempts for making the people literate. (b) There were only isolated attempts, made either by governmental agencies or by voluntary agencies. There was no coordinated, whole-hearted mass effort to achieve the aim. The element of touch-menotism was existing among various agencies. (c) Not sufficient motivation could be created among the illiterates to learn or interest could be generated among the literates to help their illiterate bretherns. (d) The quality of training imparted to the instructors, deputed for teaching the illiterates, was very very poor. (e) No effective and fruitfull follow-up activities, to sustain the knowledge and capability attained by the neo-literates were undertaken.

Having taken into consideration all the above observations only, KSSP had formulated a new methodology for the literacy campaign in Eranakulam District. The greatest emphasis was given to make this project a people's project, ensuring the involvement of everyone in society willingly, intelligently and efficiently. Thus a three-faceted organisational machinery was envisaged for the actual implementation of the project, viz, (a) Government network headed by the District Collector (b) The Project office network consisting of the project officers and other full time personnel. (c) People's network, with KSSP as its backbone.

A very detailed campaign - a chain of planned, deliberate, sustained and coherent activities-was drawn up. The objective of the campaign was to make around 1.70 lakh of people in the age group of 5 to 60, literate, over a period of one year. Along with that, it was also aimed to create new ideas and an outlook in the people, to increase overall productivity and standard of living of them, to accelerate economic and social progress of the country and to make people more and more involved in the onward march of society. The Ernakulam literacy programme was organised in such a way that more than twenty thousand instructors and tens of thousands of organisers, drawn from different groups and agencies, such as Teacher's organisations, Trade Unions, Civil Service Organisations, Political Parties,

Workmen's Movements, Youth Organisations, student Organisations, Government Departments, Local Administrative agencies etc, were made the actual fighters in the battle against illiteracy.

The first concern was how to create and maintain an ever-rising tempo in society, to generate an extra-ordinary environment in order to throw up thousands of voluntary instructors and also to break the diffidence and reticence of the would-be learners. For creating such an environment, KSSP had used all its mass media tools such as padayathras, Cinema slides, stickers, Posters, banners, hoarding, literacy walls etc., of all the tools, Kalajatha, a proven tool of the PSM was very effectively used in creating the desired social tempo, even before launching the programme.

On the 23rd January, 1989, a "Saksharata Jyothi" an ever burning torch, which has been a beacon light throughout the campaign, was lit and 3 days later, on the Republic Day, the total literacy programme of the District was officially inaugurated. KSSP organised five padayathras, starting from five corners of the district and converging at Cochin on 26th January, which, in fact, made the trumpet call, pronouncing the war against illiteracy. Subsequently block level, panchayat level, and ward level conventions were organised and many popular committees were formed. Deputy collectors, Tahasildar, BDOs, Panchayat Executive Officers, Village Officers etc were given specific assignment by the District administration in this respect and most of them were to function as convenors of literacy samithis at different levels, At each level members from voluntary agencies also acted as joint convenors.

On 18th March 1989, a massive survey to locate the co-ordinates of each and every potential learner was conducted. By that day eighty per cent of the six lakh house-holds in the district were surveyed, About 50,000 volunteers participated in this activity. In addition to collecting the names and addresses of each and every illiterate person in the district, the survey provided an opportunity for effectively announcing the commencement of the crusade against illiteracy in the district. This announcement has been further consolidated by a large number of posters, banners and hoardings etc. that have already appeared in thousands, all over the district.

In the mean time, the academic group which was entrusted with the job of preparing the required text books and other study materials, had been steadily working. A special book for the learners titled 'AKSHARAM' (The letter) was prepared. A hand book for teachers was also prepared. Further, seven additional reading books for the teachers and two work-books for learners were planned. Emphasis was given in the training programme, to encourage discussions on various life experiences of the learners and to promote the propose among them a new vision of life. It was not at all to create mere awareness but to enable them to look at the world, around, them, more meaningfully. In short, the plan aimed not only to teach the people how to write and read alone but also to make them understood the extent of exploitation, they are subjected to, in their everyday life and the real factors behind the actual process of impoverishment they were undergoing. Thus as a PSM, KSSP has been trying to enlarge the dimensions of literacy work to a higher level. With this concept in mind 1,000 master trainers and about 20,000 instructors (out of which around 12,000 were women) were tra

ined. In the beginning, most of the project personnel were not optimistic about the availability of voluntary instructors. But even the most optimistic person was pleasantly surprised to find the inflow of voluntary instructors. In fact, they were the nerve centres of the literacy programme. Their commitment to the cause and their selfless and sincere endeavours, decided the success of the programme. The youth of Ernakulam District, especially the girls took the programme as theirs and they immersed themselves completely in it. Since a large chunk of illiterates were women, the services rendered by the women instructors in Ernakulam were highly praiseworthy. Moreover these young girls got such an exposure for the first time and they were able to readily increase their self-confidence in performing a public service. Again this was the first occasion in which the manpower potential of such a large number of young women could be utilised en masse in any developmental activity in the state.

Another speciality of the programme was the conduct of almost all the training programmes for master trainers and instructors through public contribution. There was a great enthusiasm on he part of the local people to become involved in this massive effort. When the whole atmosphere of the entire district of Ernakulam was surcharged with the call for literacy, because of the concerted efforts of all agencies, including different mass media of communications, no section of the community could keep away from the main stream. For the steady progress of the programme, the tempo once created had to be maintained constantly. For this, propaganda continued ceaselessly. Twenty teams of artists and activists of KSSP and other organisations travelled to every nook and corner of the district, gave performances and spoke about the total literacy programme. Thousands of posters were displayed. Individuals and organizations sponsored stickers. Banners and hoardings could be seen everywhere.

Once the enrolment was on, every effort was made to bring the entire illiterate population of the proposed age group, to the class. After the first round of enrolment was over, fresh tempo had to be created to bring in the remaining 20 to 30 % of the illiterates too. Again padayathras were organised. All the school children of the district took the literacy pledge and went round in Jathas to encourage such people. The International Literacy Day 1989 was celebrated in Ernakulam in a unique manner. KSSP organised two padayatras starting from the southern and northern ends of Kerala, so as to reach Ernakulam on 8th September, the International Literacy Day, after covering all the districts of Kerala to salute the neo-literates and their instructors and to disseminate the thrilling and inspiring experiences in Ernakulam, among the people of other districts too. Two Kalajatha teams also accompanied the padayatra to perform at various centres of reception for the Jathas. Various skits on the theme of literacy were performed by the Kalajatha teams. In fact it was a preparatory work for taking up the total literacy programme of the state.

On that day a massive rally was organised in Ernakulam. A large number of neo-literates and instructors and organisers participated in the rally. A massive art festival and competition was organised for the neo-literates. Various competitions were conducted among neoliterates at various levels, giving them an opportunity, perhaps for the first time in their life, to reveal their hidden talents on a public platform. The presentation of such performances before the public enabled them to improve their self-confidence tremendously.

n different parts of the district, more than 18,000 classes were going on. The methodology visualised in the project proved to be very effective. The illiterate people showed keen interest in attending classes. The interest shown by them from the very beginning never dwindled; the number of drop outs was very few. The learners were determined to learn and the instructors were excited to teach. To the majority of the young instructors-unemployed girls and boys-these hectic activities served as a liberating occasion-liberation from pessimism, liberation from the sense of being unwanted and liberation from inactivity. Nearly half the learners were above the age of forty and had poor eye sight. More than 60,000 spectacles had to be distributed among them. Even though, the total expenditure in this account, came to Rs. 10 lakhs, half of it was met through donations from the public and the state government.

Towards the close of the whole project, a strict and honest scientific evaluation was also arranged. Both internal and external evaluations were conducted. Of the 1.6 lakh persons, initially enrolled, more than 80% achieved literacy levels higher than those prescribed by the NLM. Of the remaining, about 10% of late starters, are expected to make the grade soon. Now the follow-up work is going on in Ernakulam.

Towards the close of 1989, the universal immunisation programme was launched in Ernakulam district. For the success of the programme, the instructors and the neo-literates contribute their efforts. In each panchayat, a Jana Sikshana Nilayam (JSN) is being established, which would become a center for all subsequent follow-up programmes. Even at the ward level (something approximately equal to that of village) literacy circles are being formed which may carry out the follow up activities at the grass-root level. Now Eranakulam is a very fertile land for a PSM to spread its activities quickly and effectively. Having been inspired by the experience of Ernakulam, the Government of Kerala has launched a massive programme of making the whole state literate in this year of International literacy. If this massive programme succeeds, the 1985 dream of KSSP of making Kerala totally literate in five years, will be fulfilled. With the rich experiences in literacy work at Ernakulam, KSSP would be able to contribute a lot for the complete success of the total literacy programme of the state.

A precedent has now been set for a PSM intervention in literacy work through the involvement of the KSSP in Ernakulam Literacy programme. This has paid rich dividends. We have learnt that literacy work can be combined with efforts for the development of a scientific and, what is more, optimistic world outlook. The Ernakulam model of the literacy campaign and its resounding success once again reiterated the capacity of a PSM to conceive a massive programme, demanding people's participation and implement it successfully. The self confidence at the time of organising BJVJ has been redoubled by the success of literacy work at Ernakulam. Now the same type of campaign in literacy is being conducted by another PSM, the Pondicherry Science Forum for achieving total literacy in Pondicherry. The progress shown in the Pondicherry programme also indicates the success of the PSM experience in the field of eradication of illiteracy.

A point about financial costs. The Rural Functional Literacy Project and the State Adult Education Project were the two major literacy efforts in Kerala, till the Ernakulam model came along. Under these schemes the total cost of a project, to make 1.6 lakh persons literate would ha

ve been about Rs. 2.5 crores. As against this the NLM sanctioned only Rs. 80 lakhs for the Ernakulam Project. The project was a success only because of the contribution of free labour by thousands of people. Their earnest and selfless effort to function as volunteer instructors and organisers constituted the single most important factor in the success of the programme.

The experience of PSM in the literacy work brought out the following facts.

1. A PSM, by its own experience, can make the literacy programme a people's programme. The participation and active involvement of most of the people from all walks of life can be ensured by its communication tools which had already been tested and found fruitful.

2. By intelligent, imaginative and coherent, coordination a PSM can build up a very effective team work among the bureaucrats, social activists, political party workers, students, youths etc., which can be used for any developmental activity. In Ernakulam there was a massive involvement of government officials from the District collector down to village officers, religious leaders, science activists etc. The involvement of a large number of bureaucrats in the programme generated a new relation between the people and the civil service.

3. The organisational network built up for literacy will be highly useful in carrying out multifarious developmental activities. It would provide a firm foundation for a truly democratic society with the active, creative and scientific participation of the people in administration and development.

4. The manpower of millions and millions of youth in the country can be properly utilised for making this country fully literate.

THE BHARATH JAN VIGYAN JATHA AND THE BHARATH GYAN VIGYAN JATHA

Dr. T. Sundararaman

In April 1987, a number of voluntary organisations involved in the popularisation of science and for ensuring that science is used for benefit of the people, referred to as people's science movements, came together at Delhi to launch a unique programme called the Bharat Jan Vigyan Jatha. This conference preceeded by months of informal discussions arrived at three important decisions: Firstly, a general statement expressing the shared perspective of these various groups called the people's science movements was adopted. Secondly three central slogans were adopted as the expression of what the Jatha would seek to propagate. Science for the people, Science for the nation, Science for discovery, thirdly a national organising committee and a programme of action that would culminate in the Bharath Jan Vigyan Jatha.

The National organising Committee of all 26 organisations and groups present had an eleven member central executive committee that planned and led the programme. As first function, the central executive committee finalised the project proposal and submitted it tothe National Council for Science and Technology Communication (NSCTC), a wing of the Department of Science & Technology of the Govt. of India. The NCSTC had played a key role in the initiation, and ideation of this project and agreed to support the entire programme including actions such as the central office, net working functions, training of resource persons of preparation, of the necessary software and a part of the cost of organising Jathas.

The operational objectives of the BJVJ were essentially to organise teams of scientists teachers, middle class Govt. employees and volunteers drawn from different walks of life, into five Jatha's, northern southern western, eastern and north-eastern jathas. Each such Jatha travelled for 40 days covering about 100 to 150 Centers. At each centre they put up a theatre programme consisting of skits, folk plays and songs, propagating the central theme of scheme. In addition, a software team was to accompany each Jatha that would touch a smaller number of centres and use the medium of posters, slide show lectures, science toys and video films to propagate the central theme. In preparation for the Jatha 500 local organising committees were set up with mandate to arrange the publicity and reception of the jatha as well as to undertake a pre-Jatha science popularisation campaign, using the software available.

The Bharath Jan Vigyana Jatha was a tremendous success. It received wide publicity and met with wide acclaim, approval and enthusiasm at almost all centres. The software prepared for the Jatha and pre-Jatha activities could not be distributed at many centres for logistic reasons as well as delayed time schedules, and the inability of many centres to carryout such work. The southern Jatha and northern Jathas fully utilised the software in the Main jatha.

Wherever the software component could be operationalized the jatha successfully elicited a very positive audience response. The Kala Jatha component however was the main attraction, and received the expected and hoped for favourable response.

The BJVJ had a major role in seeding the people's science movement in India. In West Bengal Paschim Bengal Vigyan Manch, the Bihar Vigyan Manch in Bihar, the Andhra Pradesh Jan Vigyan Mancha in Andhra Pradesh, the Haryana Vigyan Mancha in Haryana and the Kanpur Science forum and Allahabad Science forum were formed for the BJVJ. In Tamilnadu the Tamilnadu Science Forum, the Madhyapradesh Vigyan Sabha, in Orissa, Srujanika, in Pondicherry the Pondicherry Science Forum and in Gujarath the Gujarath Rajya Vigyan Sabha, were already existing organisations with some work to their credit and, were able to consolidate and expand into much larger organisations with extended state level contacts, and have continued to grow since. For Eklavya, Kerala Shashtra Sahitya Parishat, Karnataka Rajya Vijnana parishat - three well established organisations the BJVJ entailed a new level of activity. In Maharashtra, Assam, Meghalaya, Uttar Pradesh and Punjab the PSMs did not expand after the BJVJ, while in Rajasthan, Jammu & Kashmir, Goa, Sikkim Andaman and Lakshadweep Islands and some of the north - eastern states the impact was negligible. The All India People's Science network came into being after the BJVJ. The Bhopal rally, the first All India People's Science congress at Cannanore in Feb. 1988, Second All India People's Science at Calcutta in March 1989 and the Third All India People's Science Congress organised at Bangalore in March 1990 are important mile stones in the growth of the People's Science Movements and draw their inspiration from the momentum imparted by the Bharath Jan Vijyan Jatha.

The newly formed or activated people's science movements have conducted a number of successful programmes at the state level, such as children's festivals, science teacher training for school teachers. Difficulties were encountered because the concept of Jatha was new and there was no clear idea as to what nucleating role such centres would be able to play. Further, in many organisations preparatory work for the jatha was not undertaken with the perspective that these should form future PSMs centres. Instead, a number of PSMs did not consider such a state level organisation desirable, or were unclear about the role and potential of PSMs. All these factors contributed to the poor follow up of these local organising centres, or persons, either at the State level could not be identified who recognised the need and scope of continuing PSM activities in the post jatha period or as was more often the case, whose personal commitments came in the way of the realization of such a model. In these places the least gain was realised.

The long term impact of the BJVJ was thus to nucleate or activitate people's science movements and thereby create a potential for further efforts in scientific awareness. The size, central theme, the number and nature of organisations networked, limited its reach to a small section of the population. This size was sub- critical to effect any sustainable change in the awareness levels of the nation as a whole. For a programme to reach out to all the villages of

India, to create sustainable and measurable change, we need to mobilise many more organisations, individuals and groups and we need to address even more basic issues. The Bharath Gyan Vijnana Jatha with its main emphasis on creating an awareness about literacy addresses such a basic issue. Literacy is an issue that can rally the broadest possible sections of all those individual groups and organisations who are sincerely committed to democracy, development and change. Without literacy there can be no meaningful democracy, nor can there be any form of participator development. Without literacy it is meaningless to talk of the growth of a scientific and secular democratic spirit.

The adult literacy process is an activity that can be used effectively as a vehicle for the promotion of scientific awareness, or an awareness about health and of the possibilities for development. It is a process that offers unique possibilities such as entry points for introducing social change, for it involves person to person contact for about 200 hours, with the most oppressed, suffering and forgotten sections of our society. Literacy endows confidence and a sense of completeness or self reliance to an oppressed man. It helps him to reflect and to critically appraise his own reality, and by being able to be objective about it to transform it. it is thus a process that can potentially awaken and mobilise the very sections of society that need to be mobilised most. It is a process that brings into the national mainstream crores of illiterate and backward sections who on account of thir very illiteracy and backwardness have been manipulated as vote banks, and as stumbling blocks to democratic development by local and national vested interests.

The mandate of the Bharath Gyan Vijnana Jatha is not a programme of undertaking the teaching itself. The BGVJ could only hope to contact and bring together all the various democratic forces working for, or are interested in universal literacy in India, into a single major stream.

The BGVJ is conceived of as a "conscientisation" or "awareness" creation exercise, which is massive enough to bring back literacy as a major item on the agenda of the people, democratic bodies and the government. In sheer operational terms it involves a 40 day Jatha in each and every district in the country, with 3 to 4 programmes per day - that is a total of about 150 programmes per district. These jatha programmes will be given at a centre catering to between 5 to 10 surrounding villages, and will have a convener and a local organising committee. At each of these centres, in addition to publicising the coming jatha and raising the resources for hosting the programme, four persons, one of them a women will be equipped to discuss or deliver lectures on four topics - Literacy for liberation, The World we live in, Being healthy, and Indian women learn, advance. The four persons trained for the purpose are urged to conduct atleast 40 lectures (or 10 lecturers each) in the surrounding five to ten villages. Assuming there are 500 districts in the country (actually about 480), we arrive at the following targets - 60,000 centres catering to three lakh to six lakh villages, covered by

500 jathas; 2,40,000 persons trained to deliver lectures, including 60,000 women. As a massive awareness creation excercise, the size is big enough to create a measurable impact on literacy.

The single major operational task is to identify the man power and set up the appropriate oprganisational structures at all levels. These structures must involve a larger number of individuals, groups and organisations from various streams, if the programme is to succeed. In comparison to the Bharath Jan Vigyana Jatha, the Bharath Gyan Vigyan Jatha has raised the targetted operational objectives by a factor of hundred.

The next question that immediately arises is "What next?" If there are no follow up measures taken the impact of the jatha however powerful it is, peters off rapidly and the organisational structures created dissolve and disappear. What is the follow up envisaged and what form of organisational structures are to the mounted?

The major agenda for follow up, and the most logical follow up action is literacy. Past experience with adult education in India, both governmental and by voluntary adult education in India, both governmental and by voluntary effrots, based on the setting up of centres as part of the project have yielded very poor results in terms of the indent they have been able to make on literacy as a whole. The efforts are far too small, and suffer from a number of drawbacks.These have been officially attributed to the poor motivation of learners and teachers. In contrast the mass campaign approach (not to be confused with the MPFL - mass programme of functional literacy) has nationally and internationally yielded better results.

Such a viable model has been successfully field tested at the district level on the Ernakulam Literacy campaign. Two projects - one for the total eradication of illiteracy in Kerala, and another for the total eradication of illiteracy in the Union Territory of Pondicherry (population 8 lakhs literacy: 55%) is now under way. Both these are also based on 'total massive campaign' approaches. Efforts to start a few more district level projects in Tamil Nadu, Karnataka, Harayana, West Bengal and Gujarat are underway. The essence of the Ernakulam model (total massive compaign approach) is to identify all illiterates in the age group 15 to 45 by a special census, early to make a few broad generalizations even now, based on theoretical grounds and the limited experience available. They include:

i. Any successful adult literacy programme will necessarily hinge on a successful mass campaign.

ii. Any successful adult literacy programme will necessarily involve people's participation in a major way, and this participation should be broad based and cover the major sections of society - including most political parties, trade unions, peasants organizations, women and youth groups, teachers and students, cultural movements, science movements, voluntary organizations intellectuals etc.

Any successful adult literacy programme requires the broad based moral support of all the above mentioned forces and involves setting up of organisational structures that can weld all these forces together into a concrete programme of action.

Any successful adult literacy programme that involves achieving the goal of total illiteracy eradication, governmental involvement - both of men and materials, and funds - is at present unavoidable.

Finally, and most important, any such programme of action that is successfully implemented needs a core team of dedicated, capable persons motivated for the cause of literacy. Only such a team can form an organizational structure that can draw in all the democratic forces and generate armies of volunteers needed to do the teaching. It is obvious from the experience gathered so far that paid volunteers (Even of a nominal honararium) pose many problems. Results are far more encouraging with voluntary recruits.

At the district level total literacy campaigns, one will have to evolve mechanisms of continuing adult education as well as 100% school enrollment, with low drop out rates in the primary stage to ensure that there is no relapse into or recurrence of illiteracy.

Though many districts in India can be identified, which satisfy all the pre-requisites for a total literacy campaign, most districts in the HIndi speaking areas are not yet ready for it. Of all the limitations discussed, the identification of motivated man power is the central issue. The BGJV can therefore be seen as a major input to identifying, inspiring and developing the man power necessary for such a people's programme of literacy. It is true that in many areas, as of today an inadequate number have been identified to organize the BGVJ but it is only by taking up activity in such areas that we can identify suitable people.

The BGVJ offers the possibility, that we may be able to liberate India from illiteracy, by bringing literacy campaigns on to the political agenda, as a peoples priority by popularizing the ways of achieving this goal and by identifying and motivating key persons for the campaign. It is time for it to go beyond offerring critiques of the governments record on adult education and boldly intervene in both policy making and its implementation. We cannot take the position that eradication of illiteracy must await thorough social change. Instead, we must see the literacy programme itself as an entry point for social change.

AIPSN AND BGVJ

Another question to be considered is the role of the AIPSN in the BGVJ and literacy work, especially when we bear in mind the limited manpower available with the constituent units of the AIPSN and the demands on them in areas like health, environment, development etc.

a. As has already been noted, even in states or districts where AIPSN has an active base

the BGVJ is too large a programme to be handled by it alone, the BGVJ will demand the mobilization of a very wide section of the people. The locus stands of the AIPSN is its experience in the organization of the nation wide Bharat Jan Vigyan Jatha.

b. People's Science Movements believe that Science in its broadest sense can become powerful agents of change. However, this cannot be affected if we confine our interaction to a very small segment of the society. PSMs activity base has to be as broad as possible. Literacy work offers us the broadest possible base. This is an essential pre-requisite for the development of the scientific world outlook in society.

c. Involvement of People's Science Movements in the Literacy work can help to inject scientific awareness into the content of literacy. This is essential if literacy is to become an instrument in the hands of the people in their fight against oppression and poverty.

d. In a historical context, where secularism has become a matter of crucial importance for the survival of india as a nation, involvement of people's science movements and other secular and democratic processes in a task touching upon more than half of the population of India assumes a very potent character. This becomes doubly important when we bear in mind that fundamentalist forces too can make use of this opportunity.

e. The BJVJ has engendered All India People's Science movements and its organ the AIPSN. However, we have not been able to build up a well connected, well spread out organization. The very wide and well linked organizational set up with, about 60,000 committes, and nearly 500 districts committees envisaged for the BGVJ can help us to over come this limitation.

f. In the process, the BGVJ will throw up besides literacy workers hundreds and thousands of PSM cadres and leaders. Without such an expansion the PSMs cannot have an impact on Indian society. It is only through them that we can take the issues of health, environment, development, self reliance to the people at large. Even at this stage, we need to come up with imaginative programmes on health and developmental issues, that can be taken up as follow up activity by BGVJ centres, that will not be involved in Literacy campaigns immediately. Science Education, formal and non-formal, songs and cultural activities, outlets for science publications especially children's science maganizes are other possible activities that will increase the reach of the PSMs and will keep these centres functional.

g. A nation wide organisational setup, hundreds of thousands of people working towards a single goal, consciousness of being partners in this gigantic effort, (The patriotic spirit that India should not enter the 21st Century as the most illiterate nation in the world) all these will contribute to national integration, and will serve as a major impetus to all those forces which are interested in seeing us change into an advanced, modern, New India.

DEVELOPING INSTRUCTORS

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The National Literacy Mission is an ambitious societal mission with the objective of imparting functional literacy by 1995 to eighty million adult men and women, in the age group of 15-35 years, who have remained unexposed to the basic skills of reading and writing in their childhood. Of the many weaknesses of school education, one which stands out is the lack of relevance to local socio-cultural and economic milieu. Functional literacy, therefore, rightly goes beyond the basic skills of literacy i.e., reading, writing and arithmetic, of a level which makes the adult self-reliant. It aims at making the adults aware of the generative causes of their deprivation, and enabling them to move, in an organised manner, towards the amelioration of their conditions. Having become aware of their predicament and the possibilities of change , it further aims at their participation in the process of development. With a view to improving their economic status and general well being it provides for acquisition of new and improved skills. The mission gives a special stress on their imbiding certain values which are crucial to the nation like national integration, conservation of environment, women's equality and small family norm. "To enable them to read the world around and not just the word" aptly describes the overall objective of that adult education programme.

The mission is being implemented at present through the following schemes:

a.	Rural Functional Literacy Project (RFLP)	Central Govt. sponsored scheme
b.	State Adult Education Programme (SAEP)	State Sector scheme
c.	Assistance to Voluntary Agencies working in the field of Adult Education	Central Govt. sponsored scheme
d.	UGC-assisted Adult Education Programme	University Grants Commission
e.	Mass Programme of Functional Literacy - A Voluntary programme being implemented through students, NSS and non-NSS, NYKS, exservicemen, housewives etc.	Central Govt sponsored scheme
f.	Shramik Vidyapeeths	Central Govt sponsored scheme.

The National Policy on Education, 1986, looks at adult education as an essential part of the strategy to reduce educational disparities and as a means of people's liberation from

ignorance and oppression. "The whole nation", NPE declares "must pledge itself to the eradication of illiteracy, particularly in the 15- 35 age group". The Policy envisages that the programmes of literacy can become meaningful only when they come along with a package comprising practical information and skills relevant to day-to-day needs of learners. The Policy also envisages a commitment to eradication of illiteracy to make it a truly national programme.

Post-literacy and continuing education are important to ensure that new literates (also referred to as neoliterates) continue to use and reinforce their literacy skills and do not relapse into illiteracy. Facilities for continuing education are, therefore, indispensable from the point of view of human resource development and creation of a learning society. Jana Shikshan Nilayams (JSNs i.e. People's Education Centre) are the first ever institutional mechanisms for providing post-literacy and continuing education. The JSN facilities would be available not only to the neoliterates and other adults but also to school going children, school drop outs and practically to all people in the village - men and women - willing to avail of these facilities.

The programme envisions JSNs as a multi-dimensional and multi-functional organisation with the potential of becoming the nerve centre of the village socio-cultural life. The Mission envisages the following:

i) Establishment of JSNs for a cluster of 5-6 villages, with a population of about 5000. JSNs would be integrated with the programmes of adult and non-formal education and would be housed either in a school building, Panchayat Ghar or any other community centre.

ii) JSNs would provide facilities of library, reading room, Charcha mandal, information window on developmental programmes, along with sports and cultural activities. Resources such as Radios, TVs etc. would also be provided.

iii) The JSN would provide a forum for village level functionaries of development departments like ANM, Village Health Guides, Anganwadi Workers, Gram Sevak etc. All development programmes would be expected to utilise the JSNs for their extension activities and a forum for interaction.

iv) JSN through its Charcha Mandal would help the people in getting together and articulating through discussion their common problems, needs and priorities and how to bring about change through organised action. It would also promote inculcation of awareness about national goals and values like conservation of environment, small family norm, women's status etc. and catalyse cultural creativity of the people.

Prerak will be the functionary incharge of a JSN. In addition to looking after JSN, the Prerak will also oversee about 8 to 10 adult education centres (AECs). Prerak will be selected from the local area and preferably an experienced and successful AEC organiser. The qualification of a prerak would be more or less same as that of an AEC organiser i.e. the Instructor.

An adult education centre (AEC) is the basic operational unit in the Mission at the village level. More than one AEC can be set up in the village depending upon the local demand and requirements and the availability of the AEC organiser who is called the Instructor. The Instructor is generally expected to be a local worker acceptable to the community.

During 1988-89, as per reports of National Literacy Mission Authority, more than 3 lakh AECs were functioning all over the country in different schemes described earlier. About 30,000 JSNs have also become operational during this period throughout the country. Out of more than 500 voluntary agencies involved in the Mission are running projects through AECs.

The mass programmes are run through individual volunteers who are drawn from particularly all sections of the society and include school students, housewives, exservicemen, etc. Trade unions, various employer organisations like railways etc. are running the programme in both modes i.e. AECs and volunteers. Major portion of the Mission, however, is through the centre- based mode only.

The Instructors are the frontline workers in the programme and are virtually its backbone. The quality of Instructors in terms of their knowledge, skills and attitudes is crucial to the success of the programme. Development of the instructors through training and other means of professional growth holds the key to the effective functioning of the programme.

This paper attempts to take a critical look at the existing support system for the training and development of instructors.

A close look at the profile of the instructor along with an understanding of the socio-cultural milieu of the learners would help develop the perspective which should guide the managers of the programme. The focus is at the village level. Since the Prerak is also being essentially a village level functionary, it is expected that the dimensions and requirements of their job would also be covered broadly.

THE PAST SITUATION

Speaking of the importance of instructors, the Kothari committee (1980) said that the success of the programme initially depend on their initiative and skill. It stressed that the great persons as instructors and on providing them with good training and satisfactory conditions of work and service.

Describing some positive features of the situation regarding adult education instructors, the Committee said the following:

"We find some positive elements in the present situation regarding adult education instructors. Their selection is no more confined to primary school teachers, and they now come from various backgrounds and bring different categories of skills and assets to the programme. Their selection is generally made from amongst individuals who have volunteered to participate in the NAEP and is mostly restricted to those residing in the village where the

centre is located. The instructors thus have a better report with learners and possibilities of absentee instructors have been considerably reduced. Despite this, the situation is far from happy. Instructors do not occupy a key position in the organisational chain and rather than being a group of enthusiastic and enlightened workers, they often give the impression of being a professionally ill-equipped and neglected group. This unhappy situation is due to several factors, among which the following may be mentioned:

- The available pool of individuals in a given locality for selection as supervisors is limited. As one goes into the interior, this becomes even more inadequate. It is particularly weak in respect of women, the Scheduled Castes and the Scheduled Tribes.

- The selection of instructors has so far been heavily weighted in favour of men, sometimes due to apathy on the part of the organisers, often of necessity. Not only is the number of women instructors small; their educational background and enthusiasm for work is generally lower. The proportion of instructors who belong to the Scheduled Castes and the Scheduled Tribes is also unsatisfactory.

- The remuneration of instructors is inadequate and the gap in the remuneration and status between the instructor and the supervisor is wide.

- The instructors get their salary for ten months only. This is followed by a two month break after which a fresh appointment is made. Not infrequently, experienced persons who have conducted adult education centres fail to get reappointed.

- In instructors seldom have an opportunity of being promoted as supervisors; they also do not have scope for advancement in other spheres.

- The quality of training of instructors is unsatisfactory. Although the NAEP envisages 21 days cases instructors start work without any training or with a mere formality of training spread over a week or ten days. Programmes of continuing education or refresher training are insufficient.

To remedy this situation action has to be taken on several fronts".

The Committee further suggested that steps should be taken to enlarge the available pool of persons who can be appointed as instructors, specially in remote and backward areas. In such areas the choice of persons available is limited and should be enhanced by involving two categories of persons. (1) The persons selected to work as Community Health Workers, secretaries of Panchayats or cooperatives (including milk cooperatives), persons in charge of the balwadis/anganwadis, etc. may be encouraged to function as adult education instructors. (2) A large number of village youths is given training of various types for self- employment - for example in poultry farming, horticulture, social forestry, village industries, etc. It would be of advantage if persons of both these categories could function as adult education instructors, because they would be able to link their work with adult education. It would be necessary to

introduce a component of adult education in the training of such persons so that some grounding is provided for their selection as adult education instructors. Special arrangements will have to be made to increase the availability of women and local tribals for appointment as instructors. Condensed courses, suitably oriented for the needs of the NAEP, should be organised for women and the tribals. Close cooperation should be established with the Central Social Welfare Board, which administers the scheme of condensed courses, as well as some other schemes which can be of help in involving in NAEP of women and other priority groupsin the NAEP.

In order to organise a meaningful and effective training programme and methods or professional development of the instructor and the prerak, it is important to develop a clear-cut understanding of the functions both these village level functionaries are expected to perform. It should be appreciated that while describing these functions it is not possible to identify each and every specific activity both of them will perform. The selection of specific item/activity would/should depend upon the local situation and the milieu in which the functionary is called upon to function.

While some roles may be common, some others would be different and specific depending on the level at which the functionary is discharging his/her work.

"Learning for Participation" - delineating the approach to training in adult education, brought out by Directorate of Adult Education, Govt of India (1987), defines the roles of instructor and prerak as given below.

ROLE OF INSTRUCTORS

ORGANISER OF THE CENTRE

(a) Environment building - organising meetings and discussions for highlighting adult education as a tool for individual and community development.

(b) Knowing the community - composition: Sex and age distribution, Scheduled Caste/Scheduled Tribe population, occupation, land holdings, available infrastructure facilities, wage pattern, social problems, village institutions, pattern of local cultural talents, literacy levels, etc. through personal contacts, study of records and help of other functionaries including supervisors.

(c) Discussing the adult education programme with local people in groups with a view to increasing the motivation and involvement of the community.

(d) Identifying and enrolling of learners for the adult education centre.

(e) Making arrangements for physical setting conducive to learning (location, light,

teaching/learning materials, environment, seating).

(f) Sharing of experiences of the centre for the preparation of a part of the material for the project bulletin to be brought out by the Project Officer.

(g) Understanding the proper use and maintenance of materials.

EVALUATOR

(a) Maintaining the record of the learners progress.

(b) Evaluating the learners achievement with their own participation.

(c) Evaluation of achievement of Adult Education Centres with the participation of community and learners.

(d) Taking follow-up action to improve the performance of the centre on the basis of feedback received from learners, community and supervisor.

TEACHER OF LITERACY

(a) Helping learners to see the relevance of literacy skills in the present context-by recognising the changing pattern of relationships, mobility and mode of communication in far flung remote areas.

(b) Introducing literacy and numeracy through recognition of the ability of learners in oral communication; and the need for moving from oral skills towards written skills.

(c) Imparting literacy skills in a structured and sequential order to help the learners acquire reading and writing skills to a level that the learner reads and writes on his/her own.

(d) Preparing and using literacy materials/aids effectively.

POST-LITERACY WORKER

(a) Helping learners apply the acquired literacy skills in life situations - writing letters, filling in forms, reading signs, graded supplementary readers and newspapers.

(b) Helping the learners to utilise the reading room and the library facilities at the Jana Shikshan Nilayams.

GENERATOR OF AWARENESS.

(a) Identifying with the poorest of the poor and understanding of the causes of poverty and need for awareness building programmes.

(b) Understanding the causes of low status of women in the community and recognising the need for their changed roles with reference to their participation in development efforts.

(c) Recognising literacy as a tool for liberation from oppression and ignorance.

(d) Recognising the need for the involvement of learners continuously in activities to promote group action to solve their own problems and the problems of the community.

(e) Familiarising oneself with matter relating to the lives of men and women-e.g. legal rights, minimum wages, development plans and schemes, credit facilities, health and extension services, etc.

(f) Enabling learners to articulate, raise questions and be able to disagree.

(g) Arranging for discussion with functionaries from different developing departments regarding their programmes and delivery system.

(h) Enabling people to identify specific problems and find solutions through discussions/dialogue.

(i) Enabling learners to see adult education programme as an input in development.

(j) Helping people to be aware of appropriate technology with special emphasis on improving the quality of life-e.g. smokeless chulha, solar cooker, gobar/bio-gas plants, hand-pumps, etc.

(k) Helping people to be conscious of the causes of ill-health and taking necessary steps for improving their health conditions through health promotion services for all in the community (clean drinking water, pollution free atmosphere, sanitation).

(l) Help people to be aware of the need for special programmes for pregnant (regular medical check up) and lactating mothers and the need for the immunization of youth and children.

(m) Identifying, collecting and utilising the available sources of information (Radio, TV, Newspaper, Video-Cassettes, Audio- Cassettes, Booklets, Folders).

(n) Identifying local talents in folk-arts and utilising them for entertainment and education.

(0) Making arrangements for broadcasting/telecasting successful and innovative programmes.

DISSEMINATOR OF FUNCTIONAL INFORMATION

(a) Collecting information on the possibilities of improving existing occupation and management skills and on new occupations.

(b) Discussing the questions relating to the utilisation of existing income generating schemes of various departments and agencies with learners.

(c) Enabling interested and capable learners to avail of these schemes and acquire the necessary training.

(d) Exploring the possibilities of support and promotion of the skills of local draftsmen and artisans.

(e) Organising 'Charcha Mandals' to share new information/ideas.

It is seen from the above that the instructor is basically a helper and a facilitator. It is necessary that the instructor fully internalises adult psychology and the processes of adult learning. It is only with this understanding that the instructor is able to interact with the adult learners as a 'learner' i.e. like a member of the group in a group-learning situation and not in condescending manner as school teacher usually does with young school students. The National Literacy Mission (1987) recounts the research studies and experiences all over the world including India and states that adults participate in literacy programme if

- They are already involved in political action, or some socio- economic programmes, and they perceive literacy as a part of the total development process;

- there is an environment to promote and value literacy, there is mobilization;

- the programme begins with something of direct interest to the learners: economic betterment through learning of new skills, discussions on political questions, family health, enabling them to read religious texts etc.;

- the instructor is competent, regular, not patronising, knowledgeable and a good person;

- the environment in which they are expected to learn is lively cheerful, relaxing - and activities which help them to overcome fatigue and drudgery are organised;

- they can overcome the initial diffidence which would happen if they can perceive that they are able to learn and progress from state to stage;

- arrangements exist for the literate people to continue their education;

- women visualise literacy programme as a means of their coming together, of mutual solidarity and enhancement of self-confidence and self-image.

It will be quite apt to quote, perhaps, the most original and stimulating educational philosophy of our time given by Sri Aurobindo, who says

"The first principle of true teaching is that nothing can be taught., The teacher is not an instructor or task-master, he is a helper and a guide. His business is to suggest and not to impose. He does not actually train the pupils mind, he only shows him how to perfect his instruments of knowledge and helps and encourages him in the process. He does not impart knowledge to him, he shows him how to acquire knowledge from himself. He does not call forth the knowledge that is within; he only shows him where it lies and how it can be habituated to rise to the surface.

" The second principle is that the mind has to be consulted in its own growth. The idea of hammering the child into the shape desired by the parent or teacher is a barbarous and ignorant superstition. It is he himself who must be induced to expand in accordance with his own nature. There can be no greater error than for the parent to arrange beforehand that his son shall develop particular qualities, capacities, ideas, virtues or be prepared for premanaged career. To force the nature to abandon its own dharma is to do it permanent harm, multilate its growth and deface its perfection. It is a selfish tyranny over a human soul and a wound to the nation, which loses the benefit of the best that a man could have given it and is forced to accept instead something imperfect and artificial, second rate, perfunctory and common. Every one has in him something divine, something his own a change of perfection and rate, perfunctory and common. Every one has in him something divine, something imperfect and artificial, a chance of perfection and strength in however small a sphere which God offers him to take or refuse. The task is to find it, develop it and use it. The chief aim of education should be to help the growing soul to draw out that in itself which is best and make it perfect for a noble use.

"The third principle of education is to work from the near to the far, from that which is to that which shall be. The basis of a man's nature is almost always, in addition to his soul's past, his heredity, his surroundings, his nationality, his country, the soil from which he draws sustenances, the air which he breathes, the sights, sounds, habits to which he is accustomed. They mould him not the less powerfully because insensibly, and from that then we must begin. We must not take up the nature by the roots from the earth in which it must grow or surround

the mind with images and ideas of a life which is alien to that in which it must physically move. If anything has to be brought in from outside, it must be offered, not forced on the mind. A free and natural growth is the condition of genuine development. There are souls which naturally revolt from their surroundings and seem to belong to another age and clime. Let them be free to follow their bent, but the majority languish, become empty, become artificial, if artificially molded into an alien form. It is God's arrangement that they should belong to a particular nation, age, society that they should be children of the past, possessors of the present, creators of the future. The past is our foundation, the present our material, the future our aim and summit. Each must have it due and natural place in national system of education."

(A System of National Education)

The above principles enunciated by Sri Aurobindo are as true for adults as for the children. It may be difficult to attain the vision of Sri Aurobindo these principles ought to however be the lights for guidance of all the training programmes in the National Literacy Mission.

The participatory training methodologies which are based on the foundations of basic principles of education would become helpful in developing instructors who could be imbued with the above spirit as enunciated by Sri Aurobindo. The participatory training approach would encourage the participants to see themselves as a source of information and knowledge about the real world with which, based on their own experience they can develop strategies together to bring about changes in their immediate situation.

The pace and quality of learning is a function of several factors of which the key factor is the instructor. Learning takes places in a manner and environment in which the learner derives pleasure as a consequence of the learning process. In this situation, the learner not only learns but becomes motivated to learn more, the learning becomes a voluntary act and it is acquired not only from pre-designed teaching-learning material but also from the environment. Despite the advances in instructional technology and the possibilities of using of the mass media, the importance of human relationships in the teaching-learning process cannot be minimised and, hence, the instructor enjoys a certain centrality in the teaching-learning process. This is true more so in the case of adult learners who for centuries have been oppressed and have lived in a culture of silence'. The system will have to be designed to focus on the instructor and not bypass him/her as has been happening by and large in the programme till now. The National Adult Education Programme had emphasised on the key position and centrality of the instructor in the whole programme but the Kothari Committee (1980) in its review lamented the fact that the "instructors did not occupy a key position in the organisational chain and rather than being a group of enthusiastic and enlightened workers, they often gave the impression of being a professionally ill-equipped and neglected group". It needs to be realised at all levels of management and policy making in the pogramme that the adult education programme would be as best as the instructor will make of it. The centrality of the instructor would have to be understood in operational terms and every step will have to be taken to ensure the primacy of the instructor in the whole teaching-learning process. One of the ways of doing this would be to judge the performance of every institution and functionary in the programme from the point of view of their contribution to the strengthening of the abilities of the instructor. It could be said, in other

words, that instructor should be the topmost agenda in every activity or programme related to adult education.

TRAINING OF INSTRUCTORS

The essentials of training could be given as below:

Duration : Minimum training of 21 days

Content : training in the use of teaching-learning materials including audio-visual aids; training in working with community and others; training in assessing the learners; minimum knowledge of health and development schemes and areas of national concern.

Group size : Not to exceed 30

The training has to be strengthened considerably through the use of the latest technology (video, audio systems), and institutional structures. The training methodology has to be participatory and experimental. The instructors need lot of help to develop their own articulation and build self-confidence in their ability to interact with the community, learners and functionaries of other departments. The training methods, therefore, must provide opportunities and experiences which ensures development of these qualities in the instructors.

MATERIALS FOR INSTRUCTORS

a) All materials given to the learner should also be part of instructor's material

b) Teachers' Guide

c) Games and audio-visual aids

d) Additional information material (content sheets on areas of national concern, mother and child care, population educatio.. nd other areas relevant to the learners and community).

e) Diary for personal use

f) A badge

Enhancing the status of the instructor in the family as well as in the community in a visible manner should be kept in view. The effectiveness of the instructor would also depend on how her/his status as a functionary of the programme is perceived by the village population. The diary which has been suggested could be useful to help the instructor jot down her/his own thoughts and sentiments about the various difficulties, frustrations, problems and even successes which come in her/his way as a part of her functioning. The diary need not be

treated as an official document to be produced to a superior officer since that will not encourage a frank, honest and sincere relation of experiences and defeats the very basic purpose for which it is created. The diary could also be made functional by giving a calendar of activities along with details of some developmental programmes and suggestions for taking them up along with their timing and the manner.

METHODS

The Directorate of Adult Education, Government of India, has surveyed various claims made by some adult educators concerning the efficacy of their methods in making adult literates in a very short time. The prominent among those whose methods found special mention are late Shri S.L. Purohit of Rajasthan, Shri Hayat Ulla Ansari of Lucknow and Shri Pallipad of Kerala. A close look at their experiments in evolving these methods reveals the following:

i) all these persons were highly motivated and their motivation and passion led them to use their creativity to design methods and techniques which helped them to improve the pace of imparting literacy.

ii) in devising materials as part of their methods they made use of their ingenuity to utilise cheap and local material.

iii) all these methods appeared to be replicable with training of the practitioners.

iv) in all these methods there was considerable amount of activity involving adult learners in the teaching-learning process.

The lessons we can draw from these above:

i) the motivation of their instructors is a key factor is order to enable it to use their creativity and enhance the importance of hightening their motivation.

ii) all methods involved a lot of participation and activity on the part of the instructors and learners, thus enhancing the motivation of the participants.

Therefore, the methods of training as well as teaching should be such as to heighten the instructors own motivation and once this is achieved it should be possible for them to design material using the local resources and evolve their own communication strategy to spread learning. This means that the importance of training assumes much greater significance than it has been so far recognised and in training we need to introduce methods which should characterise the following:

i) promote creativity and self-expression

ii) methods should include recreation, joyful and opening up activities leading to articulation of the participants.

iii) and should make use of non-instructional activities, such as games, excursion, dance, music etc.

The net result of these methods should be confidence building among instructors as well as learners. In India we have traditions of story telling which could be effectively used to make training and learning methods interesting.

iv) it is a well-known fact that many people although illiterate can calculate very efficiently the things involved in their day- to-day transactions. Similarly our craftsmen make many intricate designs, Indian women draw several religious designs and figures, if these special characteristics of Indian culture and traditions are appropriately integrated with learning. It could contribute in enriching our methods and motivating the learners in acquiring new knowledge and skills.

INCENTIVE SYSTEMS

The design for motivation centered programme for the National Literacy Mission (Annex I) suggests the devising of a system of awards for functionaries and learners. Some of the incentive systems as given below could be provided for in the programme for the instructors.

- Educational allowance for children education
- Group insurance
- Preference in Navodaya Vidyalaya admission to children of instructors
- Preference/priority in development schemes like IRDP, TRYSEM
- Creation of consumers cooperatives

This is only a suggestive list of activities and not an exhaustive one. One has to continuously think of ways and means of enriching the incentive system for the instructor.

LEARNER'S INCENTIVE SYSTEM

To improve the home environment of the learners they may be provided with:

a) visual material with minimum writing

b) calander with messages

c) a badge

d) opportunities to visit other areas

e) preference in programmes and schemes of development departments on the lines suggested for instructors.

INSTITUTIONAL ARRANGEMENT FOR TRAINING

The existing facilities for training instructors have been very inadequate and far from satisfactory. While recounting the experiences of the implementation of National Adult Education Programme since 1978, National Literacy Mission based on several evaluations of the programme of institutions of social science research like Tata Institute of Social Sciences, Indian Institute of Management, Ahmedabad, stated that the quality of training of functionaries and specially of the instructors was poor. Practically, no regular institutional arrangements have been created so for. The State Resource Centres are not able to organise in adequate numbers, the training of trainers and the training aids. The infrastructure of the field projects are stillworse imparting residential and participatory training programmes to the instructors. The Kothari Review Committee recommended that establishment of District Resource Units (DRUs) should be expedited and that these institutions should ensure with the help of the SRCs that the best available persons in the community are associated with the training of instructors. The National Literacy Mission proposes setting up of DRUs in all the districts which could be set up either as a part of District Institute of Education & Training (DIET) as independent units with adequate coordination with DIETs. The major function of the DRU would be the training of adult education and non-formal education functionaries at the district level. The other function of the DRU would be to provide academic and technical assistance to District Boards of Education, orient the functionaries of developmental departments and other concerned agencies at the district level and mobolise media support etc. As on April 1989, more than 100 DRUs are in the process of being set up in different parts of the country. It is hoped that with the creation of these institutional arrangements at the district level in the form of DRUs, the infrastructure for the training of instructor would be suitably augmented bringing about the desired changes in the functioning of the instructor.

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SCIENCE FOR THE PEOPLE
(Some tasks of People's Science movement)

Dr. Sanjay Kumar Biswas & M.A. Sethu Rao

We generally think of science as something practised in laboratories, taught in schools and colleges and providing knowledge for industrial use. While all these are certainly parts of Science, to limit Science to these activities alone is too restrictive.

Science is essentially a world view. The well known British scientist J.D Bernal wrote two seminal volumes (Science in History and Social Function of Science) where he shows that Science embraces all forms of human activity. It is only the scientific analysis of all human affairs which provides a genuine understanding of our past and present. He shows that only such an understanding can lead to a happy and prosperous future for humanity.

The destinies of science and humanity are closely interlinked and cannot be separated from each other. Science whether as a practice of unravelling nature or as an ideology to understand life and culture exists, so that human beings make use of it for building a better life. It is thus no longer sufficient to build good laboratories and industries and debate as to what should go on in these laboratories and industries. It is imperative to build movements which rouse the people to adopt scientific thinking and analysis about their own lives, society and environment. It is only such a movement which can direct scientific and industrial practices to yield knowledge and goods useful for the people. It is only such a movement which can inculcate scientific awareness, ideology and temper amongst the people. Such a decisive shift in people's ideology in the final analysis is the only guarantor for irreversible change in society for the better.

Scientific ideas-bulwark against reaction:

It is worthwhile at this juncture to consider the character of this movement. The character of the movement is the character of science itself. Science is always progressive. It progresses by conducting a relentless struggle against what is outmoded, what is backward and what is false. The people's science movement is a movement which forges itself in struggle against backwardness, obscurantism, chauvinism and decadent ideas. Our past and present history is replete with examples where application of scientific ideas to any sphere of human life has faced acute resistance from forces of backwardness.

Battle in the field of politics:

1989 general election in India saw political polarisation in the name of religion. Vested interest sought to divide the people in the name of religion. The whole of northern India became the scene of bloody clashes and violent skirmishes between communities who have lived together peacefully for centuries. It is in this explosive situation that forces which are secular and scientific fought an unprecedented valiant struggle to defend secularism and

establish communal harmony. Mitrasen Yadav who stood for scientific values was given the mandate by the people of Ayodhya to fight communalism, reaction and dark unscientific forces. Yadav elected on a CPI ticket was murderously attacked the day after his election by the forces who want to rule the people by keeping them divided, ignorant and backward.

History and Philosophy-battle ground for Scientific ideas:

It is only a few years ago in 1978 that we saw the book on Indian history written by three of our most eminent historians, Romila Thapar, Bipin Chandra and R.S. Sharma burnt in the streets of Delhi and the Government banning the book from the curriculum. The author's only fault was that they dared to make a scientific analysis of our past and presented facts as knows to us using scientific method.

It is the same struggle in another discipline which prompts one of our most eminent philosophers Debiprasad Chattopadhya to seek armed protection when he visits the capital. Prof. Chattopadhya like the above historians had decided to wage war against what is dead and what is obscurantist in our own philosophical past. He has stood for a scientific analysis of our philosophy and has irrefutably shown that India's scientific and materialist tradition is as rich as her spiritual tradition. Secular academicians such as Chattopadhyaya and Rahman have been harassed and their lives threatened as they dared to take up the cudgel for science. Sharp polarisation in the sphere of education between forces scientific and unscientific are too well known to bear repetition.

Conflicts in the arena of hard core sciences:

The struggle for scientific ideas have also recently entered the citadels of practising science. A NCERT exhibition on Evolution organised by a well known biologist and prepared at a substantial cost was smashed and destroyed by these goondas of reaction as it dared to say that man came from monkeys and not created by the gods. A Well known theoretical physicist was given notice by the governors of an Institute for he came out of the four walls and actively propagated scientific values amongst the people and considered it his bounden duty as a scientist to do so.

Thus we see that in every sphere of human thought the central battle is between forces which stand for science and scientific ideas and those who represent backwardness, reaction and obscurantism. Whether we win this struggle or not will depend upon people's involvement and our ability to arouse the people into a movement in defence of science in the broadest possible sense.

Science and Culture:

Outside the arena of ideology and thought Science and Technology affect every aspect of our material being. It is therefore crucial that we are conscious and aware of our needs of today and in future and play an effective but constructive role in shaping science and

technology practice. The Science which does not always yield products which can be directly used for human welfare often initiates ideas, concepts and frameworks which can be converted to useful products by Technology. Equally important is the role of science in creating a progressive culture the hall mark of which is intense questioning, acute and passionate debates and a perpetual spirit of inquiry. Such a culture which is the bread and butter of a scientist if encouraged diffuses into the society at large and acts as a main bulwark against backwardness and reaction. Such a culture is what helps us most in our struggle for freedom, democracy and a better life. It is imperative therefore that peoples' science movement must ensure a free and unfettered growth of scientific practice and fight to establish that science taught in our schools and colleges become the vehicle for the progressive culture and not merely another subject or subjects for gathering information.

Medicine, Technology - peoples' friend or foe?

Medicine and Technology on the other hand are what affects our life directly. It is imperative therefore, that whether locally, nationally or internationally technology used at any level are those that correspond to the needs and interest of people who are going to either take part in the process of production, use the product or are affected environmentally by it. To give a few examples, today 70,000 medicinal drugs are being sold in India. The number of common drugs needed by the people of India on the other hand are 120 as listed by the World Health Organisation. Multinational companies view with each other in peddling dangerous and useless combinations such that often for the same disease there exists more than 100 choices to the people. These combinations and their advertisements add cost which is doubled and trebled by fancy packing and exotically shaped bottles. The end product is a financial poison. As most of these drugs are banned in Western countries for reasons of physical danger the financial poison turns often into body poison as well. How is this totally wasteful, expensive and dangerous practice allowed to continue in playing ducks & drakes with peoples health where the share of the national market by indigenous drug industry is less than two percent? This is a matter of greatest concern. While this practice continues our competent biochemists and phramacologists stand frustrated as none of their indigenous efforts will ever see the light of day as a usable drug.

Energy:

Let us take next the question of nuclear energy plants in India. Nuclear energy is certainly a serious and possible contender for meeting our energy demands of tomorrow. What kind of safety measures do we need to take to make the energy processing and waste disposal safe? This has to be researched upon and debated upon. What cannot however be denied is that at the moment people who live even in the distant neighbourhood of a nuclear energy plant in India do so in a state of great anxiety and danger? Do not such people who will be wiped out in a short time or whose future generations will be born maimed and invalid in case of a leak have a right to ask what safety precautions have been taken to safeguard against such a leak? In a nuclear establishment where a scientist or on engineer working in a room is not allowed to

know what his friend next door is working on or with, right of information, democracy and debate are anathemas, let alone the concerns and care of people outside the plant. The same story repeats itself in relation to questions of hydroelectric power in Narmada and missile test range in Baliapal in Orissa. Essentially, the issue is whether local inhabitants have a right to prior knowledge and consultation when major technological projects are likely to disturb their lifestyle, employment, livelihood and in the final analysis their life itself.

Bhopal Gas Tragedy:

The same question loomed large when the poisonous MIC gas leaked out of the Union Carbide Plant in Bhopal and killed thousands of people and maimed future generation. The people working in the plant and living in the neighborhood were in complete ignorance of the safety measures adopted in the plant. The secrecy was so great that it took teams of scientists and engineers months to establish nature of the gas which leaked out. The multinational companies in their ruthless drive for super profit not only ran roughshod over people's lives and rights but corrupted our political system so much that investigations to get to the bottom of the affair were often withdrawn or thwarted administratively. What took catastrophic proportion in Union Carbide happens everyday on a minor scale in hundreds of industries, stretching across the country. Industrial health and safety are always right at the bottom of our industrial agenda.

Is development possible without democracy ?

This discussion which has been taken up by increasing number of voluntary groups boils down to the twin issue of democracy and development. It has been the practice of the votaries of so called 'development' to cry hoarse over the patriotic credentials of movements which seek to protect the people from harmful technology while these movements have very often taken stands which are 'anti development and obscurantist. Genuine problems and concerns have often boiled down to abstract and absurd positions What we have to understand and what people's science movement should take to the people of this country is that there is no contradiction between democracy, science, technology and development. As a matter of fact democracy is the life blood of science and without democracy it distorts, withers and stops being an useful social phenomenon. The very spirit of science is freedom itself. On the one hand science can only thrive in an atmosphere of fearless exchange while on the other hand it removes fetters and restrictions imposed by ignorance to free man to enjoy the full bounties of nature. It is really in this context that we have to realise that no development can be irreversible and permanent unless democracy is inherently ingrained into the very core of development itself. It is the correspondence of technology with people's needs which has historically been the fountainhead of Science and Technology. If there is correspondence a development plan is bound to succeed. Where does this correspondence spring from? A technology can only correspond to peoples need if people are involved (a) from the outset in posing the need oriented technology problem, (b) in the choice of technology and (c) full democratic participation of technicians is ensured in design and implementation of the technology. Of

course this is not to undermine the role of experts and specialists in the planning and implementation of technology. What has to be argued is that channels should exist for informing the people of the technological options and peoples choice expressed through regular democratic channels or through movements being accorded appropriate weightage in arriving at the final plans for development.

Education a must for democratic development:

Democracy implies responsibility and responsible citizen has to be educated and well informed citizen. Crying need of the hour for initiating the process of democratic development is therefore extensive and intensive regeneration of education as an integral part of our lives. Thorough refurbishing of our education system thus becomes alongside the demand for democratisation of our technological development process, the two important rallying points for people's science movement.

Self Reliance-National Sovereignty - a task for peoples science movement:

The slogan "democratisation of development" becomes a sterile slogan if the concept is confined to within local boundaries. Today technology has become such a powerful social force that the stability, integrity and the whole political future of a nation can be manipulated through technological bait. Modern history is replete with examples of how nations have been destabilised as democratically elected governments refused to kow tow to the designs of the multinational companies who controlled their economies by owning most of it. This happens as a nation intending a short cut to rapid development allows multinational companies to set up industries in their countries, go for extensive unnecessary collaboration programmes with these companies and imports willy nilly. This involvement apart from jeopardising national sovergnity, suppresses indigineous development of science and technology and thus makes the nation and the people forever slaves to the whims and caprices of the faceless executives of these companies, sitting thousand of miles away. The interest of these companies is to make super profit and this interest is more than often at variance with the interest of the people in the countries where they operate. Let us not forget how Bofors corrupted our politics to sell their guns. It is but a few years ago when BHEL, inspite of indigenous capabilities signed a collaboration deal with SIEMENS to manufacture 200 MW turbines. It is amazing that inspite of the fact that foreign equity share in most of our industries private and public is marginal and we have gained a wealth of experience in indigenous development and design in sectors such as power, steel and machine tools, our public sector industries continue to sign regular collaboration deals with MNCs. Our indegenous drug industry has never got off the ground as we from the very beginning have given the drug multinationals a free run of our country. Today inspite of indigeneous expertise we cannot manufacture an aircraft in our country without bowing and scraping at the doors of MNCs for know how and parts.

What we have done after the first decade of our independence is to slowly erode the self reliant base of our industrial development policy so much so that today whether in power,

electronics, automobile, aircraft or textile we cannot dream of any development without the participation of our big brothers, the MNCs from across the seas. In turn these big brothers in subtle and insidious ways start to control the economic and political life of our country. Thus when the multinational Union Carbide murders twenty thousand Indians we make apologetic noises and appease the big brother instead of calling him a murderer and checking him out lock stock and barrel from our country. Our subjugation, our humiliation is almost complete.

Scientists and Technologists - allies of the movement :

Not only has technology been the means through which we have partially surrendered the economic reigns of our country to the MNCs, we have in the process created the largest body of frustrated scientists, engineers and technologists in the world. Today they exist for copying blueprints, to implement know how imported or simply to do nothing. Rarely do their creativity, ingenuity and expertise find an indigenous useful outlet. Looking at the bulk of our scientists and engineers one often wonders whether we have ever achieved independence.

It is the stringent task of a people's science movement to expose this backdoor selling off of our national sovereignity and economic independence, in the name of modern technology. It is the duty of this movement to join hands with the practising scientists and engineers to raise the banner of self reliance.

Peoples Science Movement - Custodian of Peace:

Finally it is the duty of the People's science movement world over to fight for peace and against war. Let us not forget that development of sophisticated weapons of mass destruction using the fruits of science and technology is negation of the very spirit of science. It is this prostitution of science which thwarts development and endangers human life and the environment of our planet. Today a body of scientists world over are prepared to stand up and be counted on this issue. Let us not forget the forty physicists from Illinois who staked their whole career as scientists by refusing to accept a cent from the obnoxious 'Star War' programme of Ronald Reagan. It was the Nobel laureate Joliot Curie who was the first president of the world Peace Council. Scientists and Engineers have always been at the forefront of peace movement. The only destiny of Science is to acquire knowledge for human welfare. When that destiny is distorted for the purpose of destroying life it strikes at the very core of a scientists existence and he shudders in revulsion. Any form of violence and war is anathema to science. It is for today's people's science movement as the guardian and custodians of the real values of science and technology to bring the scientists and engineers out of the four walls of their laboratory and work place and join hands with them to prevent misuse of science for war, ensure peaceful development and a conflict free region and peaceful world.

It is regional conflicts and tensions which often trigger off monumental expenditure for the procurement of weapons such as the Bofors guns. The expenditure restricts much needed

development programmes and makes third world countries prey to political and economic pressures from Western Countries which act as agents of multinational gun dealers.

The peoples science movements can play an important role in their quest to prevent misuse of science, by linking up with movements and scientists from across the borders. The interests of these custodians of the real values of science wherever they are is the same and that is in the interests of the people. Mutual understanding and recognition of concerns and anxieties of people from across national borders can go a long way in diffusing regional tensions often created artificially to serve vested interests. This diffusion of tension will release enormous material and human resources for peaceful use of Science and Technology for human welfare. A solemn responsibility thus lies with the peoples science movements to make sure that the clouds of Hiroshima never darken our skies again and our children and grand children can look forward to a bright blue dawn of happiness and prosperity.

TECHNOLOGY IN SELF-RELIANT DEVELOPMENT*

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1. INTRODUCTION

In order to discuss self-reliance in technological development, this paper starts with a definition of development according to which self-reliance must be an essential condition. A distinction is next drawn between self-reliance and self-sufficiency and some characteristics of self-reliance are spelled out. To link the objectives of development and self-reliance to technology, the innovation chain leading from a concept to a product/process in the economy is then described. By discussing the impact of technology imports on the innovation chain, a viewpoint is developed regarding how the innovation chain must be achieved to ensure self-reliance in technology. Finally, some historical features of Indian technological development are presented,

2. DEVELOPMENT = NEEDS-ORIENTED, SELF-RELIANT, ENVIRONMENTALLY SOUND GROWTH

The experience of the past forty years shows that development must not be equated with growth. Far more important than the sheer magnitude of growth is the structure and content of growth, and the distribution of its benefits. Once a particular pattern of growth takes root, neither it's structure and content, nor its benefits, can be easily altered. Growth for the benefit of the elite e.g., processed and packaged foods, expensive cloth, luxury houses, capital-intensive private hospitals, richly endowed universities, and private cars, cannot be transformed easily into growth for the masses i.e., cheap food and cloth, low-cost housing mass health care, education and transportation. The GNP by itself does not reveal what constitutes it, e.g., cars or buses? or who benefits by its i.e., the elite or the masses?

Development must be defined therefore, not merely as growth, but as the process of socioeconomic change principally directed towards:

(1) Satisfaction of basic human needs (food, clothing, shelter, health, education, transport/communication, etc., and employment which makes all this possible), starting from the needs of the neediest, in order to reduce inequalities;

(2) Social participation and control in order to strengthen a self-reliance that grows from within; and

(3) Ecological soundness in order to achieve harmony with the environment and make development sustainable over the long run.

This view of development is totally different from a simple GNP- maximizing approach-whereas the former is concerned primarily with human beings, the latter is preoccupied with goods and services. The former is deliberately directed towards the neediest (who are incidentally the majority in developing countries), whereas the latter hopes that benefits will spontaneously trickle down to those underprivileged. According to the development-oriented approach, what goods and services are produced is of central importance, but this question is of little concern in GNP- maximizing approach.

3. SELF-RELIANCE

A further difference between the view of development presented here and the conventional growth maximising approach is the emphasis on the way needs are satisfied. It is stipulated that, unless these needs are satisfied in a self-reliant way, a crucial condition of development is violated.

Technology is a vital factor in the achievement of self-reliant development. But **technology becoming an instrument for self- reliance** is not committed to the same objective as that of **technological self- reliance**. Further, 'self-reliance' must not be equated with self- sufficiency. Hence a brief discussion of the distinctions is necessary.

"Self-sufficiency", which obviously denotes a situation in which the system has enough resources within its domain to meet its requirements, is not a necessary condition for the achievement of "Self-reliance". Self-reliance does not preclude the system from interacting with other systems and having 'import-export' dealings with them -- it may permit and even encourage this inter-dependence. The stipulation is that the system must not become dependent on these other systems in such a way that the result is an external control over judgement, decisions and actions, and a subservience which erodes the system's ability to make independent decisions and carry them out. But, the fact is that there may be trade-off between the political benefits of self-reliance and the economic costs of foregoing interdependence.

Further, self-reliance of the whole system does not necessarily require self-reliance of its technology sub-system, for imports of energy could be used to generate other exports which ensure the self-reliance of the country. There is, however, a danger here; the dependence of a sub-system may subvert the self- reliance of the whole system; for example, the dependence of many countries on the imports of oil or technology is threatening their self- reliance.

It is clear therefore that there can be many objectives which might be considered in the case of technology:

* technology self-sufficiency

* technological self-reliance (that is, self-reliance of the technology system)

* self-reliance of the whole system (not necessarily including self-reliance of the technology system).

The **minimum** developmental objectives should be to promote self- reliance of the whole system i.e., the country. Having ensured national self-reliance, a further objective could be to achieve technological self-reliance.

4. THE INNOVATION CHAIN

It is now necessary to go deeper into the transformation of research into technology and the process of innovation.

Innovation is distinguished in the literature on the study of Science and Technology from **invention** even though these two terms are used interchangeably in ordinary language. The term innovation is used to describe the process of transforming an idea or concept into a product/service in the economy. It includes much more than the term **invention** which is usually restricted to the process of going from an idea or concept to a contrivance or prototype or design. Innovation must involve in addition to invention the crucial process of commercializing or installing the product or service in the economic activity of the country.

The process of innovation can be represented - - as pointed out above -- by the so-called **innovation chain** which is the chain of steps leading from an idea or concept to a product/service in the economy. The exact sequence of steps depends upon the sector - - industry, agriculture, transport, education health communication etc. In the case of manufacturable products or services, one possible sequence of steps may be as follows:

Idea/Concept ---- Relevant Basic Research ---- Applied Research - --- Development & Design ---- Engineering for manufacturing ---- Marketing ---- Product/service

In this model of innovation, Relevant Basic Research (RBR) refers to the synthesis of assembly of understanding relevant to the technological objective; Applied Research (AR), to the activity of demonstrating the technical feasibility of the synthesis of understanding leading to a new product/service that will "work" in the economy, i.e., that meets performance, reliability and economic requirements: Engineering for manufacturing (EfM) to the activity of demonstrating that the working product/service can be manufactured at a price acceptable to the economy. The output of RBR is new concepts/materials, that of AR, a feasible device/technique, that of D&D a working device/technique/system, and that of EfM, a manufacturable device/system:

Concept - - - -> Feasible Device - - - -> Working Device - - - - > Manufacturable Device

The process of research covers Relevant Basic Research and Applied Research, and "development" covers Development & Design as well as Engineering for Manufacturing:

Research = RBR + AR

Development = D&D + EfM

R & D = RBR + AR + D&D + EM

The research part of an R&D organisation has two functions:

(1) It generates relevant research,

(2) It recognizes relevant research wherever it is done.

Obviously, the fraction of research that is internally generated must depend on the size of the organization - - the smaller the organization, the smaller the organization, the smaller the fraction of research that is done internally or "in-house", but this fraction should not be "zero", because "you can't get from the general pool of research without giving something back".

An **invention** consists of the prototype after development and design, and the technology for the product is the result of Research, Development and Design and Engineering for manufacturing But, an innovation is achieved only when the product turns up in the economy. Innovation therefore, is a much larger task than both Invention and Technology.

The RBR - -> Technology system involves a whole sequence of steps consisting of:

Relevant Basic Research - - - -> Applied Research - - - -> Development & Design - - - - > Engineering for manufacturing - - - - > Technology,

with each of the steps having special functions, distinctive outputs and measures of performance.

The sequence is not merely a succession of steps, but a system with forward-action from step to step as well as feed-back. It is a system based on people, and what the system handles is information which is passed from stage to stage via the people involved in these stages. Thus the **RBR - -> Technology system is a people-based system for information processing,** the information flow being affected by: (1) language (2) motivations, (3) organizational structure, and (4) the accessibility of people. Speaking the same language is obviously a necessary condition for communication.

Another necessary condition has to do with motivations and aspirations. Commonness of the goals, leading to the feeling of a shared mission, makes people want to communicate with each other. The definition of the corporate or group goal has to be achieved by making a synapse or conjunction between the knowledge of needs (s) and

the knowledge of possibilities, but once the goal is defined, the group needs that it implies must permeate the consciousness of individuals. Then, each person in the group can scan his area of expertise and look for those areas and solutions that are most relevant to the goal. Indeed, if the goal is challenging and worthy of pursuit, then the members of the organizations have no trouble picking the relevant job and choosing the area of relevance. In this matter, both the societal and the technical nature of the corporate/group goal are extremely important. The formulation and propagation of the purposes of the R & D organization (provided these purposes are broad and challenging enough) does not inhibit the freedom of the members who work there. They still have and make choices but they do this on a conscious basis with the full knowledge of whether their choices are relevant or not. They also play their roles in educating the group by communicating with their colleagues. Thus, sharing the same motivations and aspirations by virtue of a common goal is another necessary condition for the desire to communicate.

But the conditions of a common language and goal are not sufficient, because the flow of information between any two stages also depends upon **the organizational relationship** between the two stages and their **spatial disposition** with respect to each other. In fact, the organizational relationship between the two stages and their relative spatial disposition can be so arranged as to either facilitate or hinder the flow of information. In particular, communication is greatly facilitated both by proximity ("being able to have coffee together") and belonging to the same organization.

5. INNOVATION UNDER THE IMPACT OF TECHNOLOGY IMPORTS

Thus far, the innovation chain has been discussed as if technology imports do not occur and the process of innovation is the only way of acquiring new technology. In fact, both industrialized and developing countries import technology, and therefore it is important to understand the impact of technology imports on the process of innovation.

5.1 Bypassing steps in the innovation Chain.

The fundamental effect of the import of a technology on the innovation chain for that technology is that the import permits a part of the chain to be bypassed (Figure 1). In other words, by introducing the imported technology at a specific step in the innovation chain all the prior steps in the process of innovation of that technology can be introduced at any one of the following stage: (1) marketing/distribution, (2) manufacturing, (3) engineering for manufacturing, (4) development and design, (5) applied research or (6) basic research. One can think therefore of technology imports in terms of a multi-point switch which determines at what step in the innovation chain the imported technology enters the chain.

It is often said that a country acquired **know-how** when it imports technology. That this is too superficial a view is revealed by the above juxtaposition of the innovation chain and the import of a technology. The representation (Figure 1) shows that there are in fact different types of **know-how** and the setting of the switch determines the type of **know-how** that is acquired through the import of the technology. In particular one must distinguish between **maintenance know-how** achieved through switch-sitting 1, **manufacturing know-how** (switch-setting 2), **Engineering-for-manufacturing know-how**

(switch-setting 3), **design and development know-how** (switch-setting 4), **applied** research know-how (switch-setting 5), and basic research know-how (Switch-setting 6). In addition, one may also include operational know-how which is what the consumer requires to use the product/service.

The different types of know-how can also be ranked on the basis of extent to which they contribute to **self-reliance** (which is the capacity of a society to take and implement independent decisions), or conversely to **dependence** (which is the situation in which a society,s decisions and actions are determined by external societies). In that sense, the types of know-how constitute a hierarchy of levels of self-reliance and of dependence (Figure 2).

The concepts developed above regarding (1) relationship between technology imports and the innovation chain and (2) the distinction between the different types of know-how can be used to throw light on the Japanese approach to technology import. Japan has been a major importer of technology over the past four decades and the emphasis has been on purchasing operational and/or maintenance and/or manufacturing know-how. But these purchases of foreign technology have only been a starting point. The Japanese approach consists of the "four-to-one thumb rule" according to which, for every $1 spend on the import of technology, the technology-importing firm/agency then spends $4 on to acquire engineering-for-manufacturing know-how, design and development know-how, and research know-how for the same technology that has been imported. In other words, the approach is to work backwards through the innovation chain from the step at which the technology is imported - - this why the approach is sometimes known as **reverse-engineering.** The Japanese approach- - as is well known - - has been einently successful with the importing firm/agency often ending up technologically ahead of the foreign firm/agency from which the technology was imported. Quite often, Japanese firms coordinate their technology imports (under the aegis of their (MITI) Ministry of Trade and Industry) so that one firm imports the technology and shares the benefits with other firms in the same field so that the country as a whole advances technologically.

The Indian approach has been very different - - the general tendency and practice (see however, exception below) has been to import operational and/or maintenance and/or manufacturing know- how and make no attempt to do reverse-engineering. The result is that technology-importing firms/agencies never acquire the engineering-for-manufacturing know-how, design and development know-how, and research know-how, and research know-how for the technology that has been imported. As a result, their technological levels remain static and after some time they are so backward technologically that they are forced to go in for another technology import in order to modernize. This is why there are repetitive collaborations (like blood transfusions) at frequent intervals over a period of time. The absence of coordinated imports of technology also leads to repetitive collaborations by a number of firms at one point of time.

Thus, these are sharp differences between the Japanese and Indian approaches to technology imports. Japanese firms look upon technology imports as starting-points for reverse-engineering and make the expenditures for the acquisition of know-how for engineering-for manufacturing, design and development, and research. In contrast, Indian

firms see technology imports as a substitute for reverse-engineering and as a way of avoiding expenditures on the crucial preceding steps of the innovation chain. No wonder that the Japanese approach has proved to be a spring-board for greater self-reliance and the Indian tendency has resulted in increasing dependence upon the technology-exporting countries. It is also clear that the imports of products/services enables Japan to imitate those products/services, adapt and modify them, and finally even improve upon them. India has frequently imitated, sometimes adapted, but very rarely improved upon imported products/services because improvement depends upon competence in the engineering- for manufacturing, design and development, and research steps of the innovation chain.

There are two very important exceptions to the generalizations made above. Firstly the small-scale sector of Indian Industry often cannot afford the costs of technology imports and therefore this sector has frequently turned for technology development to Indian R & D institutions, particularly, the CSIR. In response to this demand-pull, the CSIR has often been successful in developing technology. In fact, the bulk of the products/services released by CSIR have been to the small-scale industry. The situation here is one where self-reliance is strengthened, there is no substitute to indigenous completion of the innovation chain and, as a consequence, self-reliance is strengthened.

Secondly, there are sensitive technologies for which imports are not possible because, for instance, industrialized countries ban technology exports in strategic areas. Space and nuclear technologies are well-known examples. In the case of such technologies, India has not been able to import the products/processes. Thus it has not been able to buy operational and/or maintenance and/or manufacturing know-how. The country has had no alternative except to incur the requisite expenditures to go through the innovation chain for those products/processes. Thus, it has been forced to acquire the know-how for research, design and development, and engineering-for-manufacturing for the technology that could not be imported.

There is an international dimension to this process. Innovative ability, i.e., the ability to complete the innovation chain, is an instrument for achieving self-reliance and development in India and other developing countries. But industrialized countries often see their technology exports as an instrument of control over developing countries. They also do not hesitate to use them as ways of undermining self-reliance and increasing dependence. In particular, as soon a developing country is on the verge of achieving self-reliance with respect to know-how for research, design and development and engineering for manufacturing for a technology which it was prevented from importing, industrialized countries rush in to offer hitherto- embargoed products/processes at cut-rate prices along with operations and/or maintenance and/or manufacturing know-how. Unless the benefits of self-reliance are included in the economic calculus, the temptation is to accept the cut-rate offer of technology imports and avoid the expenditures on completing the innovation chain indigenously. If this temptation is succumbed to, the inevitable result is the undermining of self-reliance.

India did not succumb to such temptations in the case of the rocket propellant which it ultimately developed indigenously. A counter example is liquid-crystal-display technology

where the imports of foreign technology on "attractive" terms destroyed India's LCD capability just when it was maturing. A similar situation is developing in the case of C-DOT technology for electronic exchanges where several powerful telecommunications multi-nationals are competing. Another example is monsoon prediction where there are offers to predict our monsoons just when the country's capability is growing in this area.

6. SOME HISTORICAL FEATURES OF TECHNOLOGY IN INDIA

The descriptions of technology and innovation in India have thus far been ahistorical. They tend to give the impression that things have and will remain the same. But, there is a dynamic in every situation. And everything has a history.

A clue to the dynamic can be obtained by looking at how the cumulative number of foreign collaborations have changed since independence. Figure 3 shows that one can demarcate main phases:

(1) the **import-substitution** phase from 1956 to about 1962 when there was an enormous growth in the number of foreign collaborations,

(2) the **intermediate** phase between 1962 and around 1979 during which there was a "trough" in the number of foreign collaborations, and

(3) the current **modernization** phase which began around 1979.

The first and third phases were the result of definite declared governmental policies, but the intermediate phase was not so much the result of explicit policy as of a conjunction of factors that were of course policy-related.

6.1 The import-substitution phase

Indian independence corresponded to the growing determination of Indian industry to assume political power and control the home market. In particular, because manufacturing and selling is often more profitable than being distributing agents for foreign products, Indian industry sought to launch the import- substitution phase around 1956 to acquire operational, maintenance and manufacturing know-how. This involved the import of a large number of technologies corresponding to the requirement of the Indian market. Since these imports took place though foreign collaboration agreements, there was a large increase in the number of such agreements.

The entire exercise was greatly facilitated by the Second and Third five-year plans based on Mahalanobis strategy of development involving a rapid growth of capital goods and the infrastructure. With this thrust, available foreign exchange was to be used largely for imports of intermediate goods and of technology. This meant that foreign exchange was not available for the import of consumer goods as was the case before. Besides many capital goods could not be imported. As a result, there was a market for consumer goods

and for many capital and intermediate goods. Both of these markets were met largely by foreign collaboration tie-ups. The policies were quite successful - - from a country which during the 1930s imported almost all manufactured products (except a few such as textiles) India started manufacturing almost all its requirements.

6.2 The 1962 - 79 Phase

The Second and Third Plans largely ignored foreign exchange bottenecks as well as agriculture and wage consumer goods. Both these shortcomings became significant as a result of the 1962 war and the droughts of 1965-67- - - the available foreign exchange had to be used now for food and other essential and defence -related imports. The resulting strain on foreign exchange reserves meant a cutting back on technology imports. In addition, the failure of the Mahalanobis strategy to make the economy/industry self-sustaining meant that the demand for consumer and capital goods become easily saturated. The mid-60s recession aggravated the situation.

It is natural to wonder how in a country with a population of about 400 million in 1956, the market could get saturated within the short span of about six years from 1956-62. The answer lies in the fact that India is a "dual society" in which only the richest 15% of the population can afford to buy the oputput of the manufacturing sector. The poorest 85% are in a sense outside the market economy because they do not have requisite purchasing power to articulate their demands. India in 1956 was for all practical purposes a market consisting of only about 60 million. Once this small market was saturated, demand declined.

Thus a combination of foreign exchange constraints and recession- demand saturation led to a decline in the number of foreign collaboration agreements between 1962 and 1969.

The beginnings of the Green Revolution in agriculture in 1969 can be associated with a resurgence of industrial growth and aggregate investment. This is what probably accounts for the spurt in foreign collaboration agreements between 1969 and 1975- 76. The similarity between the 1962 and 1975 peaks suggests that the 1969-75 spurt in foreign collaboration agreements corresponds to a replacement of the old technologies, i.e., repetitive collaboration, imported during the previous spurt in 1956-62 - - but this suggestion has to be corroborated by a detailed examination of which technologies were imported between 1969 and 1975.

What is interesting is the post-1970 demand from several groups (particularly those that had established on indigenous manufacturing capability) to ban technology imports during a period when the number of foreign collaboration agreements were rising. A cry of self-reliance was raised., Many mechanisms were established to screen proposals for foreign collaborations.

But, the cry of self-reliance was articulated in the unfavourable context of an economy slowly coming out of recession. The self- reliance slogan increasingly fell on deaf ears. The

number of foreign collaboration agreements started increasing from around 1970 and rose to a peak around 1975-76.

6.3 Options for getting out of recessions

However much recessions favour the demand for self-reliance by reducing technology imports, they are considered by the industrial sector as unfavorable to growth.

There are three options in the Indian context for getting out of the crises of recessions:

Option 1: raising the incomes of the poorest 85% of the population so that they also become part of the market which thereby becomes significantly enlarged:

Option 2: adopting the strategy of export-oriented growth; and

Option 3: modernization based on diversifying the product-mix of the manufacturing sector so that the richest 15% can buy new types of goods.

The problem with Option 1 is that the bulk of the poorest 85% of the population lives in the rural areas, and their poverty is mainly because of inadequate control/access over the crucial assets of land, water and capital. The redistribution of assets (particularly land and water) is a necessary condition for raising their incomes. But, redistribution is too radical a solution for the vested interests in rural areas. Hence option 1 is rarely chosen in developing countries.

The "success" economics of South Korea, Taiwan, Hong Kong and Singapore are usually cited when Option 2 is recommended. But there are several problems with Option 2. Firstly, the export- led growth of these four economies has been sponsored by the industrialized countries via their multi-national companies and is under their aegis. Secondly, a necessary condition for the success of the export-led strategy is the absence of trade barrlers and protectionism in the industrailized countries. Thirdly, Indigeneous technology is of the 1950s vintage and is therefore too old and inferior for the manufacturers from such technology to compete in the international export market. So, Option 2 requires massive imports of technology and the blessings of the industrialized countries and the multi-national companies.

The case for option 3 is based on the fact that the richest 15% of the population was starved of consumption goods for about 25 years (from about 1955-80). In particular, their craving is for foreign consumption goods because their philosophy seems to be:"all that is rural is bad, all that is urban is better, and all that is foreign is best" Now, the richest 15% in India is small in percentage terms, but very large in numbers- - around 1981, they constituted about 103 millions which is roughly the same as Japan's population of about 120 million. If therefore production can be oriented towards their desires, then there is an enormous market waiting to be exploited.

But in order to tap this market, the elementary-minimum-needs bias of goods/services that has characterized production since the 1950s must be abandoned/minimized and secondly, the consumption patterns of the industrialized countries must be brought in even though these westernized, consumption patterns are oriented towards luxury consumption (TVs, VCRs, private transportation (cars and two-wheelers) kitchen gadgets, etc.) But, for this new luxury thrust in the pattern of consumption, the technologies available indigenously are quite inadequate. Hence, the corollary of westrenization of consumption patterns is a massive import of technologies.

Such massive imports are possible only if the barriers to the free import of technologies are removed. In other words, all the institutional mechanisms for rigorously assessing whether technology imports are really necessary have to be dismantled. In other words, Option 3 requires the so-called "liberalization" of the economy. The elimination of controls (such as licensing) becomes imperative even though these controls may have been responsible for the careful husbanding of resources and the good house keeping which together kept India out of the debt trap into which so many developing countries had fallen.

The real problem with Option 3 is that the technology imports have to be paid for which means that once the previously accumulated surpluses are exhausted the only method of making the payments is with exports. So, Option 3 requires a simultaneous adoption of Option 2, i.e., a combination of Option 2 and Option 3 becomes obligatory.

6.4 The current modernization phase

Such a strategy of export-led modernization was mooted as far back as the 1970s with the visit of a group of US businessmen led by Orville Free man. This visit was followed by the general promotion by the World Bank of its export-led strategy. By the time India applied for an IMF loan, an export-led strategy and economic liberalization were laid down as conditions for the grant of the loan.

All These trends coming under the general rubric of modernization were initiated around 1980. They have gathered tremendous momentum since 1985. Imports of technologies have been liberalized, and as a result, there has been a tremendous increase (Figure 3) in the number of foreign collaboration agreements. Multi-national corporations have been welcomed. There has been a proliferation of luxury goods to satisfy the cravings of the richest 15%. Whether it is two-wheelers TVs, VCRs, or kitchen gadgets, foreign collaboration agreements have led to a large number of manufacturers of each item, i.e., repetitive collaborations have been liberally permitted.

India has accumulated a great deal of experience with regard to how technology imports should and should not be used to acquire technological capability and know-how. Despite this, the approach to such imports in the 1980s has not differed in any meaningful way from the imports of the 1950s. The emphasis continues to be on the import of operational and/or maintenance and/or manufacturing know-how without subsequent attempts to do reverse engineering, In fact in the current phase, there is a great deal of

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what can be called "screw-driver technology", i.e., the import of equipment, particularly electronics, in a completely knocked-down technology" i.e., the import of equipment particularly electronics, in a completely knocked-down (CKD) condition, the assembly of the equipment with a screw - driver, culminating with the claim that the equipment has been indigenously manufactured. With the persistence of this approach, it is clear that technological levels are unlikely to rise-- technology-importing firms/agencies will never acquire the know-how for engineering-for- manufacturing. design and development, and research for the technology that has been imported.

6.5 The NRI phenomenon

One of the distinguishing features of the current modernization phase is the importance given to NRIs (non-resident Indians) particularly from the USA.

Indian immigrants into the USA are in many ways unique among that country's immigrant community. They have not immigrated because of religious or political prosecution; most of them landed in the US as highly trained professionals; they occupy key positions in the professions; they are affluent they retain strong cultural and economic links with India. As a result they are in a position to offer from the US amassive amount of capital and technology.

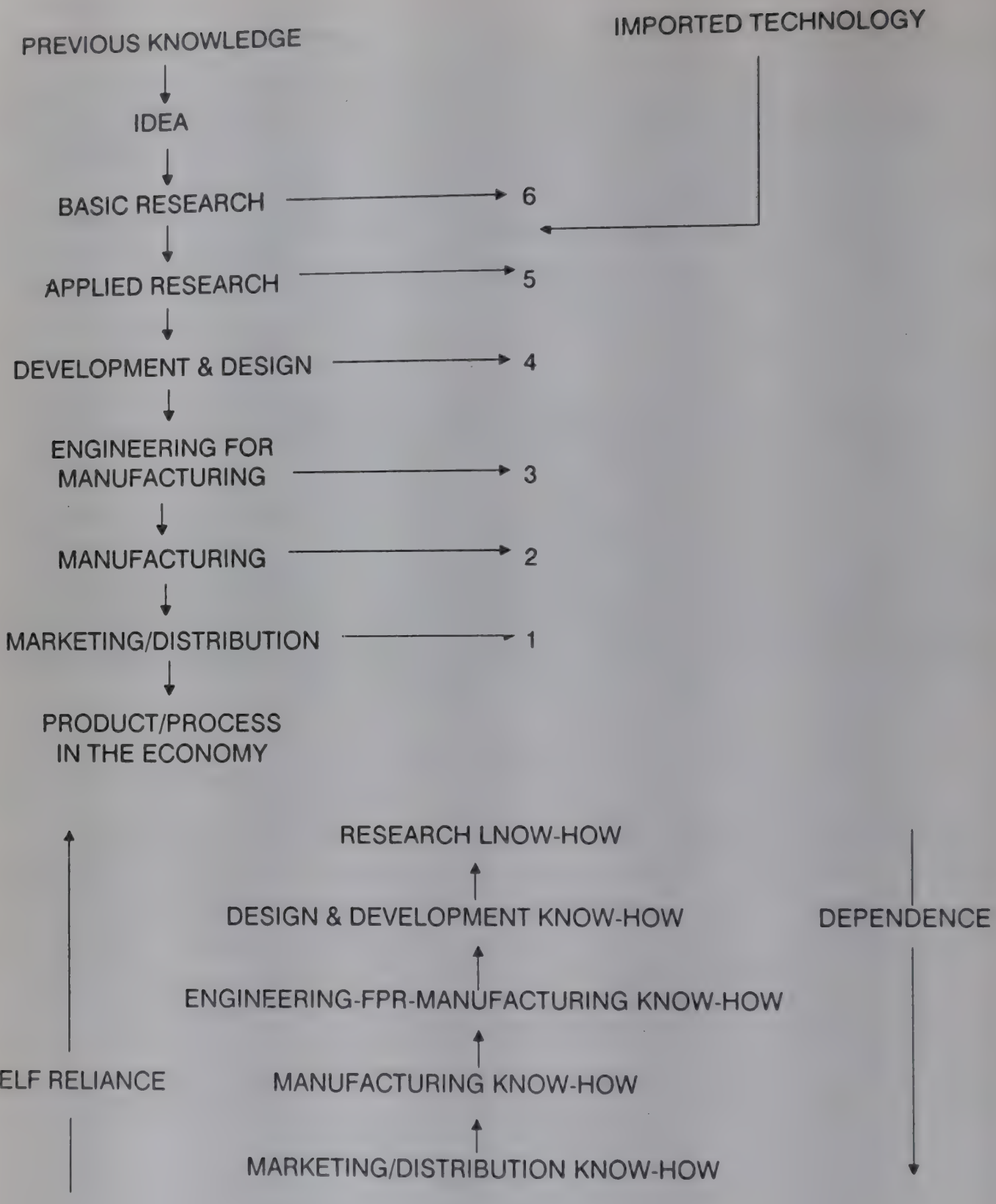
Such offer were received with alacrity by the new leadership in India for several reasons. Firstly, this leadership was unconstrained by the ties with the leaders of the scientific establishment, that the previous leaderships had built over decades. Secondly, the new leadership felt that the Indian science and technology establishment (except for space and atomic energy) had failed to deliver self-reliance and indigenous technology capability in frontier areas. And for that matter, they had not even delivered technologies for the rural poor. In this context of disappointment with the local S & T establishment and attraction to NRIs. The NRIs came up with attractive offer of capital and technology from key positions in the USA.

With such unassailable credibility, their offers were not easily refused. A few dissenting voices were raised. Was it not distorting values to downgrade the professionals who had returned from the USA in the 1960s and 1970s? Was it not more profitable for the NRIs to invest in India than in the US because of the higher interest rates in India? the NRI offers also came with a large number of demands for liberal tax and customs concessions, house sites, land etc., Also, barring rare exceptions, the NRIs were not prepared to pack their belongings in the US and come home to link their fortuness with those of the mother country.

The honeymoon with the NRIs did not last too long. The crass commercial motivations of the NRIs became obvious, and the economic price of tying up with NRIs started becoming apparent.

6.6 The next phase?

Already several problems with the current export-led modernization strategy have come to the surface. Firstly, the bills for modernization/liberalization have started coming in. The balance-of-payments situation is deteriorating rapidly. Debt problems are mounting, and it is even becoming difficult to service the debt by making interest payments. But all this is no news at all to other developing countries such as Brazil and Mexico which embarked upon the same course. Secondly, product diversification was a way out of recession for a short period during which the appetite of the richest 15% could be satisfied with luxury goods. But the market for even those goods must quickly get saturated, and that is what happened in the case of two-wheelers, many kitchen gadgets, TVs etc. It looks that the number of foreign collaboration agreements will peak for the third time (See Figure 1) and then start declining to the accompaniment of the self- reliance slogan. Thirdly, all is not well on the exports front because the export strategy is coming up at a time when the industrialized countries are raising trade barriers and protectionist policies to solve internal problems such as unemployment. Coming on to the stage of history much later than South Korea, Taiwan, Hong Kong and Singapore, can their success play be reenacted by India even when the favorable conditions have disappeared? Or, will political problems and their economic roots force Option 1 involving raising the incomes of the poorest 85% and having a huge and expanding internal market? Will it become essential to explore a development- oriented approach as distinct from the growth-and- trickle-down strategy that has been followed all these years?


PREVIOUS KNOWLEDGE
IMPORTED TECHNOLOGY
IDEA
BASIC RESEARCH
6
APPLIED RESEARCH
5
DEVELOPMENT & DESIGN
4
ENGINEERING FOR MANUFACTURING
3
MANUFACTURING
2
MARKETING/DISTRIBUTION
1
PRODUCT/PROCESS IN THE ECONOMY
RESEARCH LNOW-HOW
DESIGN & DEVELOPMENT KNOW-HOW
DEPENDENCE
ENGINEERING-FPR-MANUFACTURING KNOW-HOW
SELF RELIANCE
MANUFACTURING KNOW-HOW
MARKETING/DISTRIBUTION KNOW-HOW

Inconclusive list of demands that PSM's should raise on Energy Policies: A draft for debate

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Note : This is not a theme paper nor a paper per se. It is merely an indication of the problem of energy and a proposed list of issues that need to be raised in the areas of energy. The idea is that the PSMs would study the subject and examine the issues so as to enable an informed debate on the subject At the next congress we can debate the issues, come to a consensus and identify our differences. On all issues on which a consensus is arrived at we may formalise our views and plan action programmes. Therefore, the purpose of this note is to raise a debate and nothing else. This paper is merely indicative, and an independent study is called for to understand the implications.

1.0 General Background

1.1 At this stage of the development of India it is reasonable to expect a direct correlation between energy consumption and economic development.

1.2 The fuels in India are varied (i) commercial: oil coal, natural gas (primary) (ii) non-commercial: fire wood, cow dung, vegetable waste, Non-Commercial: (iii) solar wind power etc., Electricity (Hydro, thermal, Nuclear) is a secondary form f energy, the fuels and energy are substitutable (for examples, railway traction could be from coal and electricity desired from an of the above sources).

1.3 Fuels are also feed stock for the chemical industry (For example fertilizer can be produced from coal, oil, natural gas or cheap electricity).

1.4 Nuclear energy is deliberately left out since the issues involved are complex and need to be deliberated on separately and comprehensively.

1.5 All forms of energy exploitation be it in coal mining, oil refining, electricity generation, wind mills etc. are highly capital and skill intensive and invariably have social and ecological implications.

1.6 Transportation and utilisation of any from of energy is also capital and skill intensive.

1.7 Being capital and technology or skill intensive, there is a considerable role played by international organizations both in the financial and technological areas. We have the World Bank and Multinationals. The implications of this on indigenously built up technology and manufacturing capability needs to be examined seriously.

2.0 An Assessment

Based on the above arguments one can examine the situation in India. A Comparison is made of India as planned in 2005 and China as it actually is in 1989. The comparision is meaningful since the population of the two countries India in 2005 and China in 1984 would be almost the same.

	China 1984	India 2005
1. Coal (mt)	750	450-540
2. Oil (mt)	90	90-110
3. Electricity (6 Kwts)	350	501-592
4. Non-Conventional Source (mt)	475	500

(mt - million tonnes; bkwhs - billion kwts)

3.0 General demands on the economy vis - a vis energy

3.1 Imports of excessive technology and equipment to enable complete utilization of existing manufacturing and technological capability.

3.2 End useless expenditure and restrain consumer and luxury goods manufacture. Nationalise multinationals in low technology, high profit areas.

3.3 Augment resources for investment in energy sector.

3.4 Develop technologies and standards so as to minimise imports and maximise exploitation of indigenous resources, equipment and technology.

3.5 Plan the fuel-energy balance in a manner as would minimise imports of fuels (in 1989-90 alone imports of oil was worth Rs. 5000 crores).

4.0 Specific demands in area of energy.

4.1 Coal

a) Development of technologies like coal gasification and fluidised beds for optimal exploitation of the high ash coal.

b) Development of carbano-chemicals based on Coal.

4.2 Oil and Natural gas

a) Policies leading to the minimised use of oil in internal conbustion engines in areas of transport and pumping.

b) Policies leading to minimisation of imports of oil.

c) Minimisation of leasing oil bearing fields for exploitation and exploitation by multinationals.

d) Maximise use of natural gas as feedstock and minimise use for combustion (low power generation).

4.3 Electricity

a) Evolve policies for extensive electrification of the nation (analogous to the GOELRO plan of USSR).

b) Evolve policies of electric power generation, transmission as would maximise indigenous technological and manufacturing capability and minimise imports.

c) Maximise exploitation of hydro-power generation.

4.4 Non-Commercial energy

a) Evolve policies that do NOT lead to monetisation of cow dung and vegetable wastes.

b) Organise fire-wood fuel forests to prevent forest depletion and degradation.

c) Intensify research to evolve technologies like gasification and fludised beds to extract optimal efficiency from non- commercial fuels.

4.5 Non-Conventional energy

a) End imports of products and systems like wind mills, solar heaters etc.

b) Evolve technologies that are location specific and prioritise expenditure.

c) Intensify research on materials used for products and systems of non-conventional energy.

TOWARDS SELF RELIANCE IN HYDROCARBONS: A PERSPECTIVE

PASCHIM BANGA VIGYAN MANCH

INTRODUCTION

From the dawn of civilization, energy in any form was the single indispensable factor in any economic future and well being of a nation. Coal, oil and natural gas are considered to be conventional and versatile energy sources all over the modern world, and this is also true for India. For the convenience of transportation easily recoverable source of energy and other factors, petroleum is considered to be far superior to coal as a source of energy. Standard of economic development and progress of a nation can be adjudged from its per capita consumption of petroleum. A nation capable of producing its own required amount of petroleum from its own resources can easily improve the quality of life of its people.

Petroleum is a "strategic" mineral. The terms strategic, critical and essential minerals are the outcome of war energy in relation to the supply position necessary for winning a war. From the defence point of view, petroleum is definitely a strategic mineral. It is obvious that those substances which are highly needed during a war, are also used during peace-time. Thus the term "strategic" has another meaning as well.

A mineral may be termed "strategic" depending upon the total inadequacy in terms of its resources. Since petroleum is a non- renewable source of energy and its reserve is being exploited at a very fast rate, even in a country where the indigenous supply of petroleum is sufficient, it is considered to be a strategic mineral from both points of view. Thus achievement of self reliance in petroleum should be a goal of all the patriotic elements in a country.

Our Concept of self reliance & its relation with oil

Our outlook on self reliance has been described in detail in the theme paper "Self Reliance : Role of Science" presented at the 2nd AIPSC held in 1989 at Calcutta. " In our opinion, a self-reliance developing society is a social system which can meet the basic needs of its members by maximally utilising its own natural and human resources, and at the same time can formulate independently the economic policies of its own". We feel that all modern countries are dependent in one way or the other on other countries. Mutual dependence and co-operation are essentially required for sustaining the rising rate of development of a country. It is obvious that our idea of self-reliance does not match with the idea of self-reliance in a closed society, since the quality of life in the latter does not improve with time and the growth rate remains stagnant or declines. Our idea of self-reliance is only in the context of a developing, modern social system that can take all of its major decisions without being influenced by foreign agencies.

Here lies the importance of being self-reliant in petroleum. We cannot think of a single day without the use of this liquid fuel. In this regard, perhaps, no example is necessary. Moreover its relation with defence makes it so vulnerable, that in a country where petroleum has to be imported, major policies are sometimes influenced by multinationals and imperialistic countries.

In British India, there were only two producting oil fields - one at Digboi in Assam and other at Kheur in the Salt Range area of Punjab, which is better known as Attok oil field. After 15th August 1947, the only oil field at Digboi produced only a meager quantity of India's requirement. The rest was imported from the Middle East by three foreign Companies namely - Burmah Shell, Caltex, Stanvac and to some extent by IBP (Indo-Burmah Petroleum). A very popular story among the geoscientists concerned with petroleum exploration is that, in September, 1947, when a war commenced in the Kashmir Sector with Pakistan, the total internal reserve of petroleum within India was so low that it could bear with the war only for a few days and there was rationing of petroleum among the civilians due to the scarcity of petroleum. All of a sudden all three companies stopped supplying petroleum, necessitating a crisis. Govt. of India requested all the three companies for more supplies of petroleum. But all efforts were in vain. Although there is no official confirmation regarding the above "situation" a general opinion among Geoscientists is that the scarcity of petroleum during this period might have compelled the Government to promptly set up a separate directorate for petroleum exploration and later on convert it into an autonomous commission. Thus the importance of petroleum for a self-reliant country is obvious.

History of Oil Exploration in India.

The history of Indian oil exploration is fairly old. In 1825 an army officer Lt. R. Wilcox while surveying the jungles of Assam recorded several gas and oil seepages from a bed in Burhi Dihing river (Sinha & Sharma, 1989). In his memories, he writes: "the jungles are full of odour of petroleum". On the recommendation of H.B.Medilicott of the Geological Survey of India, six wells were drilled during 1966-67 by a Calcutta firm, two in Makum near Marghertia and four in Jaipur; Oil was struck at a depth of 35.4 meters (118.ft.) near Nahorkatiya. But on account of extremely poor transport facilities the venture failed. This was just after a few years when in 1859 1st wild cat drill well known as the Drake well, struck oil along an anticlinal axis in Pennsylvania, U.S.A. Drake well drilling under the leadership of Mr. Henry Rogers of England is also regarded as the beginning of modern petroleum exploration.

Again in 1889, the Assam Railways and Trading Company Ltd. got interested in oil, and completed a hole in 1890 which struck oil at a depth of 198.6 metres near Digboi. In April 1899, the Assam Oil Company was formed to work in Digboi oilfield. During this period a team of the then GSI went to Burmah to determine the potentiality of getting petroleum oil under the leadership of the famous Geologist Mr. Oldham. In Burmah, oil was struck at a very shallow depth, in an "Anticlinal structure", as observed by Mr. P.N. Bose. During this period oil was also struck in Middle Eastern Countries like Iran and Iraq. As a consequence of which exploration for petroleum on the Indian subcontinent was somewhat neglected during British period.

In January 1921, the Burmah Oil Company took over the commercial and technical management of the Assam Oil Company giving it much needed financial and technical assistance: Due to the non- availability of deep hole oil rigs followed by a moratorium on drilling during the war, oil exploration could not be expanded further even with the geophysical data in hand.

After independence, a petroleum geology unit was set up in GSI. Till 1953 the Digboi oil field remained the only field of oil production and also the only refinery in India. The production and refining capacity was barely half a million tonnes. In 1952, oil was struck in Nahorkatiya in Sibsagar district of Assam. Further drilling work in Hugrijan-Nahorkatiya and Moran areas of Sibsagar district established the high potential of oil.

In 1953, a Soviet delegation of experienced petroleum geologists in collaboration with their Indian counterparts undertook a systematic investigation of different sedimentary basins of India. It is interesting to note that the then Minister of Natural Resources Mr. K.D. Malaviya approached different western developed countries, but failed to get any positive response except from USSR. After intensive study, throughout India, they identified 26 sedimentary basins within the boundary of India capable of generating hydrocarbons and recommended intensive field investigations and drilling for further exploration. During this time a number of foreign companies were conducting oil exploration in India at the invitation of the Govt. of India. But after the identification of twentysix basins, the Govt. of India set up a separate directorate on 14th August, 1956 to expedite oil exploration. In 1956, the first deep drilling rig was imported from Rumania and drilling started in 1957 at Jawalamukhi in Hoshiarpur district of Punjab. By an agreement signed on 14th January, 1958, The Govt. of India set up Oil India Limited (on a 50:50 partnership basis) with the properties of the Assam Oil Co. On 15th October 1959, Oil and Natural Gas Directorate was converted into Oil and Natural Gas Commission, an autonomous body which started exploration in favorable horizons for possible oil reserves.

In 1958, eight more deep drilling rigs were imported from USSR, and drilling in the Lunej area near Cambay in Kaira district of Gujarat, Rudrasagar in Sibsagar district of Assam, Ankelswar area started simultaneously, with immediate success. In 1962-64 with the help of the Rumanian and Soviet Governments, two big refineries - one at Noonmati near Gauhati, Assam and the other at Barauni, Bihar were set up by Indian Refineries Ltd., which was later on incorporated into the Indian Oil Corporation Ltd.,

Crude oil from Cambay, Ankleshwar, Kalol, Navagaon, Vadsar all in Gujarat, was immediately despatched to the refinery of Burmah Shell and Hindustan Petroleum Corporation Ltd., in Bombay, till ONGC's own refinery at Koyali was commissioned in 1965 with Russian aid. Natural Gas from the Gujarat field is used in different thermal power stations and in different industries. Before the end of sixties, Jaisalmer, in Rajasthan, also proved to be gas bearing and a gain refinery was set up at Baroda with Russian help.

By the end of the 70s onshore oil fields at Mahsena, Kalo Kathana, Ankeswar and offshore fields at Bombay High in western India, and onshore oilfields in North East India were fully developed at Galeki, Borholla etc., and they were all put to production. The Bombay High structure was actually identified long ago in 1964-67, when a Russian survey ship fitted with instruments to detect seismic, gravity and magnetic activity traversed the Arabian sea and Bay of Bengal. They located the Bombay High structure and several other structures between the mouth of the Narmada in the North and the Kerala coast in the south. However in 1974, with the American help Bombay High was drilled and it commenced production in May 1976. In 1974, the Government of India, in the name of expediting exploration in off shore areas

granted exploration and mining rights to two American firms namely the Reading and Bates Groups and Carslberg Group. Later on other foreign agencies, particularly Japanese agencies, were also invited. Another major offshore discovery during this period was the Ratnagiri structure in the Arabian sea in 1979.

During the eighties no such major oil field was discovered, except at Gandhar and huge gas reserve at Tripura. In recent times it has been pointed out by some geoscientists that some major oil reserves may be discovered if the suggestions and scientific results of geoscientists were taken seriously. Besides the onshore and offshore structures of the Godavari Basin, and lately, the offshore Kaveri basin have been found to be oil producing. ONGC is now undertaking exploration in the Middle East countries particularly in Iraq, in collaboration with other foreign agencies.

Attitude of Industrially development Western countries towards developing countries regarding oil exploration

One of the characteristics of capitalist development during the post 2nd world war period is the name of technological support, while conserving their own resources as much as possible. This is particularly true in the case of nonrenewable sources of energy. The intensive use of natural resources and energy, forms the part of their effort to maximise production and establish control over every available part of the global market. Normally this is done through multinational corporations.

In the oil exploration sector, these multinational companies are agreeable only in the "gentleman's" contract of getting 65% of the production, if the exploration utilises their technology. The parent country obtains 35%, and if the situation is favourable for these multinational companies, they would definitely try their best to impose this contract. If the internal production within the parent country is considerable and the gap between demand and supply is comparatively low, there is a scope for the parent country to bargain over the terms of contract, for so called technological help.

Until recently deep drilling technology was available with the industrially developed imperialist countries. By using this technological know-how, and through such multinational companies they can sustain their development, with the crudes from developing countries. In thr early 1980s, France had an annual demand of 40 MMT of crude oil when its annual production was only 2 MMT. But through "Cie Francaise des petroles"-a multinational company, France mobilised its requirement from the Middle East. Japan mobilised more than 98% of its own requirement through such contract because Japan had practically no reserves of petroleum. Although about 10% of the total known reserve of petroleum in the world, is located in USA, they are conserving it for the future. Canada posseses vast reserves of tar sand in Alberta which are reckoned to contain more oil than what exists in West Asia. The technology is known but they are waiting for the future. The same is the case with U.K.

Thus with the help of their advanced technology, they are mobilising their resources from developing countries. India is now producing about 65% of its internal demand. As a result the imposition of such contractual terms in the name of technological help is so far not known. But a fall in production, in comparison to the demand may seriously effect future contracts.

The Present Status of Oil exploration in India

India has a sedimentary basin cover of about 17,80,000 sq. km., including both onshhore and offshore resrouces, which is believed be of the order of 17 billion tonnes of prognosticated resources of crude oil and gas. Of this, the geological reserves of oil and gas established so far are of the order of four billion tonnes. To date twentyseven sedimentary basins have been identified in India, of diverse origin and time spans and with varied types of accumulated sediments. Based on our current understanding of their hydrocarbon bearing status, these sedimentary basins can be classified into the following four categories:

1. **Category 1:** Proved petroliferous basins with commercial production viz. Upper Assam Shelf, Assam- Arkan Fold Belt (Tripura-Cochar), Cambay Basin, Bombay Offshore Basin, Krishna-Godavari basin and Godavari Basin.

2. **Category II**: Basins with known occurrences of hydrocarbons but from which commercial production has yet to be established, viz. Andaman-Nicobar, Bengal, Himalayan Foothills, Ganga Valley, Jaisalmer and Mahanadi.

3. **Category III:** Basins in which significant occurrences of hydrocarbons have not yet been found but which are considered to be prospective on general geological grounds-Bikaner-Nagaur, Kutch, Saurashtra and Kerala-Konkan.

4. **Category IV:** Basins which may be prospective on analogy with similar hydrocarbon-producing basins in the world-Arunachal foothills, Deccan Syneclise, Gondwana, Karewa (Kashmir Valley), Narmada Basin and Vindhyan. In recent years, exploration strategy has undergone a radical change in favour of the rapid upgradation of basins to higher categories, and is at present an optimal mix of (i) acceleration of exploration efforts in the producing basins of Category - I, (ii) intensification of efforts in category-II basins so as to bring them to the stage of commercial production and (iii) extending efforts to category -III & IV basins for future intensification of exploration-this task has been claimed by ONGC.

Trends in Oil Exploration and recent production data

It is evident from the above discussion that initially there was a tendency among Indian policy makers to be self reliant in petroleum It is also an established fact that in the beginning, different socialist countries came forward with a helping hand to build India's self reliance in this sector. It was their technological knowhow as well as infrastructural support upon which Indian exploration efforts depended most. But unfortunately, during the 1970s the initial zeal and socialist bias among the political elites began to wane. The very nature of oil exploration involves a large amount of money and thereby in all cases these are political decisions that ultimately guide exploration rather than scientific and technological information. Of course, without scientific methods such exploration cannot be carried out. But as one scientist of the ONGC, and official spokesman observed at national seminar on 11th February 1990, at Calcutta that "The different methods of surveys, geological, geophysical and geochemical, cannot as yet, directly indicate the presence of petroleum until it is actually discovered by drilling". The release of drilling sites has so far involved a purely managerial decision and the connection between the policy makers of these organisations and the political elites is

obvious.

Let us take the concrete example of "Bombay High". In 1964-67 a Russian seismic ship Akademic Arkhangelisky" at the invitation of Govt. of India first located the large "Anticlinal Structure" along with several other structures in the Arabian Sea. The Russian Geoscientists also gave the impression that these structures might be developed in "giant" oil field. But it took the Govt. of India about 10 years to take the decision to finally drill these structures. In 1974, ONGC with its own offshore jack up rig "Sagar Samrat" in collaboration with American experts was installed at the site. We are not in a position to learn of the actual terms of this contract. However, the basin is producing about 20.16 MMT of Oil and 4960 million cu.metres of natural gas per annum. Similarly at the Kutch offshore site such oil bearing structures were initially indicated by the Russians in 1964-67.

But in 1974-75, a multinational Company"Reading and Bates Group" was appointed to carry out exploration in the region, and they reported dry wells and prematurely terminated their contract giving the impression that the area has sites no prospective sites. But in 1984, ONGC scientists drilled there and struck oil in a different structure. Still, in the same year another multinational company "Chevron Oil Company" was given the lease and they again reported that the area was dry and the basin is yet to develop. All these examples are quoted from the official document of ONGC, and it is obvious that there was a change in the outlook of policy makers regarding oil exploration. The role of these multinationals in the oil exploration sector was questioned by the scientific community from the very beginning. It is clear that they would not want India to be self reliant in this sector and help India to escape their clutches.

Due to failure in identifying exploration sites, the self sufficiency in petroleum is dwindling by the day . Current production figures with respect to demand clearly illustrate the picture very well.

Demand and supply of Petroleum in the last 10 years

Year	Demand in MMT	Supply in MMT	Gap in MMT
1979-80	30	9.51	20.49
1980-81	32	9.25	20.79
1981-82	34	13.18	20.82
1982-83	36	18.23	17.77
1983-84	38	23.15	14.85
1984-85	40	26.26	13.74
1985-86	43.21	27.51	15.7
1986-87	45.81	27.99	20.75
1987-88	48.74	27.99	20.75
1988-89	51.93	30.00	21.93
1994-95	78.00 (estimated	50.74 (estimated)	27.26

Thus from the production curve it is obvious that the exponential portion of the curve during 1980-81 to 1984-85 has suddenly flattened out into a plateau, during the next five year period, although the demand is increasing at an exponential rate. The production of Oil India Limited has been stagnant over a long period, and is now producing about 2.7 MMT per annum.

A plateau in the production graph-

Some Comments

The stagnation in the production graph along with an escalation in the demand signifies only one thing i.e. day by day we are becoming dependant on imports in this important sector. As per the economic survey reports, the foreign exchange involved in the import of huge amount of petroleum, was about Rs. 136.6 crores in 1970-71 and has now escalated to over Rs. 5000 crores in 1989-90, and according to an official estimate this may further rise during 1990.91. The gravity of the situation should not be adjudged only by considering the amount of foreign exchange involved. It is true that about 50% of the foreign exchange involved in import per annum in India is being spent in this sector. But the implications are much more.

The "gentleman's" term of the multinationals has been already mentioned earlier. But with increased self sufficiency in this sector, our policy makers can at least bargain. The terms of contract are dependent on the degree of self sufficiency. In 1985, the indigenous production of petroleum was about 73% of the demand, now it has come down to 65% in 1989. If within a short spell no break through can be made in exploration, then the targeted production of 52 MMT by 1995 will not be achieved, and with such a high demand the whole picture may change. Even in the case of technological support, we may not find the terms favourable for us.

Thus it is high time to speed up explorations in different basins where the prognosticated reserve as a whole stands at 17 billion tonnes. From different experiences it is obvious that these multinational companies will not do something to make us selfreliant in petroleum. Rather, it is the feeling of the scientific community that the duration of exploration lease of different basins may prove to be very expensive in future. But despite such a record Govt. of India is appointing these companies for a long period. For example, in August 1974, the Carslberg Group was given a mining and exploration lease in the Bay of Bengal for a period of 27 years. Similarly in October 1975, the Government awarded the Asmera Group of Canada the contract for offshore oil exploration and production in the Cauvery basin. The fall out of such contracts is appreciated after quite a long time.

It is not the business of MNCs to make India self reliant in the case of petroleum.

Question of Technobureaucracy and its implication

Not only has the exploration of different basins been neglected, but even when different petroleum reserves were discovered by sincere and excellent scientists working in this field, no initative has been taken upto utilise such reserves. The situation has become so unfortunate, that one of the scientist working in this organisation commented that "scrutiny of

records will reveal that any effort of making a major discovery has been effectively suppressed by a section of officers Members and Chairman ONGC have fallen prey to these unholy forces which ultimately effectively controlled some officers in the Ministry of Petroleum, Government of India".

Cambay Experience

A reinterpretation of geological and geophysical data of the Cambay project area in 1977 by some experienced geoscientists revealed that due to the inaccurate interpretation of electrical survey data, a thick sequence of oil bearing porous sandstone of the oligocene period (about 40 million years old) penetrated eight different wells spread over an area of 600 sq. k.m., in Kothara- Kalamasar-Siswa area, occurring at a depth of 1400-1650 meters depth, had remained untrapped. It is known that the porous and permeable sandstone sequence having its pore space completely filled with salt water becomes a good conductor of electricity. But when the pore space of the same sequence of porus and permeable sandstone sequence having its pore space completely filled with salt water becomes a good conductor to electricity. But when the pore space of the same sequence of porous sandstone is filled with petroleum oil and natural gas, the rock sequence becomes highly resistant to electricity. In this area, the hard body of the oil bearing sandstone sequence itself contains appreciably high quantities of iron bearing minerals. These iron bearing minerals have made the rock body electrically conducting, inspite of its pore space having been filled with light crude oil. While interpreting the electrical survey data of the sandstone sequence the presence of iron bearing minerals in the rock structure had been initially ignored and thus an oil bearing sandstone group making place for an oil reserve of 865 million tonnes remained untrapped. A paper on "Exploration for subtle trops between Subramati and Mahi Rivers" in Cambay Basin, Gujarat was submitted at the 5th Oil Gas conference held at Dehradun in September 1977 stated the new findings." (Oil in India - a report submitted by Mr. K.C. Roychowdhuri, Ex- Superintending Geologist ONGC to PBVM). After Consistent persusation and facing tremendous official hazards, the concerned geoscientists ultimately made one drill, namely kalamser well No.1, and penetrated horizons as per prediction. Indication of the physical presence of oil was remarked by the geologists who estimated the well productivity 200 tons of crude oil per day. But raising the same question of low resistivity the drilling rig was shifted without proper testing of the well. The same thing happened in the case of other wells in the region and ultimately after a long struggle, the concerned geologist succeeded in making Kathan a well No. 26. Flowing oil surfaced from the said group of sandstone, and ONGC through a press release on 25.3.82 confirmed the news. The development for the Kalamasar Group of oil sandstone was prepared in the Cambay Project, Geology section, but execution of the plan, so important to nation's prosperity and progress, never took place.

Bengal Basin Experience

Exploration in the Bengal Basin started during the late 1940s and the total number of drill holes put up by the standard Vacuum Oil company and later on by ONGC is thirty six. Except for a short spell when SVOC abandoned the project, the Bengal Delta has always been regarded as a highly prospective ground for the accumulation of hydrocarbon on a commercial scale. ONGC still considers it a category II basin with a prognosticated reserve of 960 million tonnes of oil. But exploration here was carried out in a biased manner. On different occasions it has been pointed out by various scientists that "the identified structural features are small both in size (10 to 15 sq.km.) as well as in amplitude (20 to 20 m) and it is evident

from various survey data that Bengal Basin has a more or less homoclinal structure. The situation demands, as pointed out by Roman et al, and ONGC's scientists, a: "Change in outlook from structural to certain strati structural exploration based on sound Geologic Principles" for any "meaningful and effective exploration of the Eocene Section". During the same period another geoscientist was assigned the duty of stratigraphic exploration of carbonate rocks at West Bengal and other parts of India. By the reinterpretation of the latest seismograms of onland, part of West Bengal investigated by the Soviet team and adjacent offshore part in Bay of Bengal investigated by American Oil Companies, it was revealed that carbonate rocks deposited in the Bengal Basin are promissing along a particular alignment (NE-SW) (from about 600 meter east of the drilled well in Diamong Harbour). This zone is about 10 km wide and 200 km long from the coastal area upto the international boarder with Bangladesh. The condition of deposition of this carbonate rock is similar to that of Kuwait or the Saudi Arabian oil fields and to that of the williston Basin of North America. This zone can be easily tested by deviation of Diamond Harbour from below the shore of isolation casing at an angle of 38° towards east for reaching a horizontal distance of 600 metres and then drill a vertical well to penetrate the porous carbonate rock and produce oil from that zone. The Soviet scientists attending a recently organised "Brain Storming Session" by ONGC itself have pointed out this possibility again. The prospect of Oligo-Miocene wedge has been neglected in a similar fashion.

From the above two examples, it is clear that the prospect of oil exploration in different basins have been neglected constantly, and a regime of techno-bureaucracy is taking the decisions about exploration in different basins, not on the basis of scientific data but no other factors not known to the scientific community in general and the geoscientists in particular.

Official Secrecy Act- a barrier to scientific investigations

Different questions about oil exploration are not answered by the concerned authority since it comes under the Official Secrecy Act. All information about oil exploration are marked as "Classified documents" and even the rationality of ONGC in releasing various drill holes at different basins at particular spots are not made known to the scientific community. The findings, the well completion reports etc. are also secret documents. But it is well known to Geoscientist that oil exploration in every basin is carried out on the basis of a "Sedimentary model" to be framed up with the available data. Even with the increase in knowledge and gathering of much information about these basins, it is next to impossible for any one working within this organisations to review the existing model independently because of the prevailing situation. Thus the exploration would have to be continued on the basis of the old model, and would reflect the bias of the senior most persons within the organisations to review the existing model independently because of the prevailing situation. Thus despite the honest efforts and huge expenditures of money, oil has hardly been struck. This is nothing but a mockery of science.

On the other hand the scientists working outside these organisations cannot judge the proper situation because of the total inadequacy of data. Even the concerned State Governments are not allowed to know the facts although according to PEL (Petroleum Exploration Lease), authorities of these organisations namely the ONGC and OIL are bound to inform the state governments of the situation.

Natural gas flaring is a common site in the oil fields of India. In the process a huge amount of national wealth is wasted every day. But how much gas is flared each day is not known to all. A conservative estimate among geoscientists working within these organisation put up the figure to be of the order of several crores of rupees per day. The only available answer to the question of why such large quantities of natural gas is wasted every day, is that technology is not available to make this gas commercially viable. The question arises, as to who would develop this technology? If the exact amount of natural gas produced in these oil fields is not made known to the scientific community at large, how do they expect to develop this technology? In the days of extreme shortage of energy a huge amount of natural gas is being wasted on account of poor technology low gas pressure to transfer it to the nearest town etc. Even with a suitable technology, this gas can be utilised in the nearby villages to meet their energy demand.

Role of P S M

The question now comes as to what is to be done at this juncture? It must be made clear to every one that we are not questioning the ability and integrity of the scientists working within these organisations dealing with oil exploration. Rather, we have deep regard and respect for these scientists who are doing their best to make India self reliant in these organisations, while working under a techno-bureaucracy and in a suffocating atmosphere. It is the policy makers who are responsible for this situation. On the one hand they have involved multinationals for the exploration and production of petroleum, on the other hand they humiliate our scientists who make scientific suggestions for the discovery of oil using the available technology. This is surely frustrating sincere scientists working within these organisation. Due to the dependence on multinational oil companies and the neglect of our scientists day by day we are getting more and more dependent on import. As per the version of the Chairman of Indian Oil Corporation in the Times of India (Ahmedabad edition) dated 4.4.89, India has to approach different oil producing countries for the renewal of the contract and increased supply of crude to meet the ever-increasing demand. At present India imports crude oil from Iraq, Iran, Kuwait, United Arab Emirates, Saudi Arabia etc. The situation is becoming alarming.

Besides the matter is highly technical and policy makers are taking advantage of this situation. So it is the duty of the PSM to inform the people of the situation in "their" language, so as to build up an awareness among them, of the exact nature of the situation and thereby to organise mass movements with the help of other organised sections. By this process, those policy makers who appease multinationals within these organisations would be alienated, and we are sure that the outcome of such movements would be reflected in the nature policies. It is the duty of scientific community working out side the purview of these organisation, to gather data and information, and to study them independently, to find out the loopholes in the exploration programmes of these organisations and to come out with proper suggestions independently. Side by side, attempts should be made to create an awareness among scientists working within these organisations about the gravity of the situation and about the dangers from the multinationals. A strong mass movement would definitely encourage the patriotic forces working within these organisations, and it would expedite the process of their coming out with proper suggestions and information. Such a move would definitely create

pressure on policy makers from within these organisations. Such a combined move would definitely eradicate the barriers in the way of self reliance, in petroleum and India would move towards a better tomorrow.

Let 3rd AIPSC be the starting point of this movement.

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TOWARDS SELF-RELIANCE IN VEGETABLE SEEDS

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INTRODUCTION

India is endowed with a diversity of climate, ranging from the temperate north to humid tropical regions in the north-eastern region and the southern peninsula. Hence we are able to grow a bewildering array of vegetable crops comprising nearly 50 kinds, spread over different parts of the country, such that some of the vegetables are available round the year. Being a vegetarian country, the demand for vegetables is universal but the consumption is very low, especially in rural households. Naturally, the consumption of vegetables is dependent upon the purchasing power, especially of the landless labourer in a village or of a city slum dweller. Hence nutritional disorders in the lower strata of society in the rural regions are very common.

India produces nearly 45 million tonnes of vegetables, actually the second largest next only to China, which works out to 120 gms per capita consumption. The low consumption (compared to 250 gms in China, especially 500 gms in Beijing) results in adverse health conditions of the rural population, particularly among women and children. A target of 100 million tonnes has been set by 2000 A.D., and this target can be attained only if the low productivity of the vegetable crops is improved. The low productivity is mainly because of:

i) non-availability of seeds in sufficient quantities of high yielding varieties at the right time,

ii) inadequate plant protection measures, non-availability of resistant varieties and proven control measures and

iii) lack of awareness of new varieties and a poor input delivery system.

PRESENT SITUATION

Among the major inputs influencing the productivity, the seed programme is a very important agricultural programme. The present vegetable seed requirement of the country is of the order of 21,000 tonnes, comprising nearly 6 to 7000 tonnes of garden peas, 5000 tonnes of okra, 2500 tonnes of onion, etc. Unfortunately, the vegetable seed production programmes have been poorly organised and the Government programmes (public sector), hardly meet 5 to 10% of the total requirement leaving the rest to be supplied by private agencies and the farmers' own devices. The seed multiplication chain in Government programmes is weakly integrated and the different stages of seed multiplication, namely breeders, seed, foundation seed and certified seed, have not been properly delineated and at the end, the vegetable farmer is not able to get the seeds of the right variety at the right time and in the right quantity.

CONSTRAINTS

The major constraints of vegetable seed production can be enumerated as:

i) inadequate and unbalanced development of different components required for viable, demand responsive vegetable seed industry;

ii) lack of post harvest equipment/facilities/operation at level of technology with economic efficiency;

iii) inadequate seed technology and training to enable managers to identify constraints and develop solutions and

iv) The seed multiplication chain in Government programmes is weakly organised such that production of certified seeds especially by State Seeds Corporations is very low.

The foundation seeds of vegetable varieties produced by National Seeds Corporation amount hardly 100 tonnes and the certified seeds to about 600 tonnes only. This is a very low proportion against a total requirement of 21,000 tonnes. A target of creation of capacities to meet atleast 25 to 30% of the national requirement, has to be set up with sufficient investment in infrastructure facilities to support this production target of Public Sector Agencies. Further, regulations of quality control for vegetable seeds have to be equally applied to the private and the public sector and the foundation and certified seed production will have to be monitored under the Seed Act regulation. Even though the Seed Act provides for checking the genetic purity of truthfully labelled seeds, it is not done and most of the vegetable seeds available for sale are not guaranteed or certified even in the case of old and well established varieties, a variation is observed in genetic purity. Enforcement of the Seed Act regulations will have to be reviewed and operation procedures should be improved with the provision of competent certification personnel and facilities for large scale testing of vegetable seeds.

IMPORT OF VEGETABLE SEEDS

Import of hybrid seeds under the New Seed Policy is not a solution for providing food seeds to the vegetable farmers. Hybrid seeds alone do not solve all the problems of vegetable farmers and hybrids will not be prospective for all the vegetable crops. Only in certain crops like tomato, capsicum, cauliflower and cabbage, whose market value is high, hybrids will be taken into commercial cultivation. Further, production of hybrids should be integrated with resistance breeding, which will reduce the cost on plant protection. In fact, imported hybrids will not solve the problems of the leaf curl virus disease that affects tomato, and is prevalent in all parts of the country Import of those hybrids that are resistant to diseases not prevalent in India, will not help farmers. In the okra yellow vein, mosaic resistant hybrids will be important and these are not available with foreign seedsmen. Similarly, short day onion hybrids whose

bulbs are pungent, pink and have a good storage capacity, will have to be developed indigeneously in preference to imported long day hybrids of salad onions of yellowish colour and sweet taste. Further, the import of new hybrids sometimes throws up new diseases which were not prevalent earlier. In this connection, the occurrence of spotted wilt virus in tomato, especially in western and southern India, has been aggravated with the import of new tomato hybrids. Obviously, all these facts indicate that the import of hybrids should be allowed only after testing them in the country.

A look at the seeds imported between 1.8.88 to 1.8.89 under the New Policy reveals that only 100 tonnes of hybrid seeds have been imported over one year, comprising of cabbage, cauliflower, capsicum, cucumber, tomato and carrot seeds and the present area under hybrid varieties has been estimated as 15 to 20,000 hectares under tomato and 6 to 8000 hectares under cabbage cultivation. Most of this area has been planted with imported seeds and partly with indigeneously produced hybrid seeds from imported parents. The import of seeds sometimes makes dependence completely total as has happened in the case of Bangladesh. May be in a small country like Bangladesh, the farmers are provided with the imported seeds and they are totally dependent on the Japanese Seed trade. But in India, we should not allow such a situation to develop because there is a sizable private seed industry producing vegetable seeds, which can undertake technological upgradation to meet the new challenges.

It is also pertinent to point out that imported hybrids are not always superior to indigenous hybrid varieties. There has been some evidence to state that indigenous hybrids can yield as much as the imported hybrids. The production technology package is equally important to exploit the full potential of the hybrids. When such is the case, the marketing of imported hybrid seeds, by seed traders without proper testing and technology support, would not help the farmers and may even be against the interests of the farmers.

RESEARCH EFFORTS

It is therefore necessary to intensify research efforts in several agricultural Universities and Government Institutions to develop new varieties of vegetable crops and the concomitant technologies necessary to seed production should be worked out. Already more than 120 varieties of vegetable crops are in the multiplication chain of the Department of Agriculture, Govt. of India, under the notified list, and efforts should be undertaken to develop hybrids in vegetable crops.

Seed Production technology will have to be developed within the country especially in the case of hybrids. There should be R & D units in the Seed Industry which can test indigenous parents and which can produce hybrid seeds indigenously. This will obviate payment of huge royalties on imported parents and imported hybrid seeds. Further, the high cost of plant

protection cover in the growing of hybrids, can be reduced by developing disease resistant parents through indigenous breeding programmes. Unfortunately hybrid seed production technology in vegetable crops has not attracted the attention of both the public sector and private sector companies. Very few seed companies have the technological competence and commercial production facilities or parental multiplication and hybrid seed production. Obviously hybrid seed production in vegetable crops, particularly in the case of cabbage, cauliflower, onion, carrot, capsicum etc. would require sufficient R & D technology, which will have to be developed indigenously by both public and private sector companies. Import of hybrid seeds is not a substitute solution but can only be a catalyst for development of cost effective indigenous hybrid seed production capabilities. More research efforts will have to be undertake to reduce the cost of technology of growing hybrid varieties of vegetable crops.

IMPORT SUBSTITUTION

A Classical case of import substitution is worth mentioning here in the context of New Seed Import Policy. Way back in 1949, the Govt. of India established the Vegetable Research Station at Katrain at an elevation of 1500 metres in the Kulu Valley of Himachal Pradesh. During the Second World War, seeds of the temperate group of vegetable crops could not be imported and the Govt. of India then established a station at Quetta in Baluchistan, which later went to Pakistan. Hence, the station in the Kulu Valley became the starting point for the development of seed production technology for the temperate group of vegetable crops in this country. Over the past 40 years, this station has come a long way and indigenous technology in seed production of the temperate group of vegetable crops like cabbage, snowball cauliflower, knolkhol temperate races of radish, carrot, turnip and garden beet, spinach, etc. have been worked out. This technology has enabled the establishment of a Seed Industry in Saproon Valley and other areas of Himachal Pradesh in 1960s, and the import of seeds of the temperate group was completely stopped. Further, it has brought about an economic regeneration in the Saproon valley and other areas of Himachal Pradesh. Next only to apple, this vegetable seed production has improved the rural economy since the seed production in the temperate group of vegetable crops is highly remunerative with large profit margins. This achievement of I.A.R.I. Station had gone unrecorded and unsung and more areas like Jammu, the Uttar Pradesh hills, the Darjeeling hills and Arunachal Pradesh in north-eastern India have taken up seed production of the temperate group of vegetable crops.

VEGETABLE SEED EXPORTS

Far from importing vegetable seeds, India can export vegetable seeds. National Seeds Corporation and some seed companies have been exporting very small quantities of vegetable seeds over the past ten years to countries like Bangladesh, Nepal, Kenya, Pakistan, Yemen,

etc. But we do have potentialities for the export of vegetable seeds, and South-East Asian countries are interested in some of the tropical varieties developed in this country especially in cauliflower, onion, radish, carrot, etc. The South- east Asian and African markets are completely dominated by the Japanese Seed Trade who have developed technology in tropical vegetable varieties. However, the rich experience and the valuable material available within the country, can be put to better use, if we develop the technology for the export of vegetable seeds. This requires sufficient R & D efforts to boost vegetable seed yields so that we can enter into a highly competitive international trade in vegetable seeds. This is a case of untouched potentiality which will have to attract the attention of the Govt. of India. It is also necessary to regulate vegetable seed exports, because the vegetable seeds exported from this country by some seedsmen did not meet strict quality regulations, in terms of genetic purity, germination and packing standards such that repeat orders were not received. It is, therefore necessary that the vegetable seed export trade should be better organised with sufficient R & D efforts. Here again, the Government and the Seed Industry should work in close coordination, to develop a base for vegetable seed exports.

GOVERNMENT POLICY

This will involve a clear enunciation of a Vegetable Seed Policy, with higher priority by the Govt. of India. It is necessary that such a seed policy should have as its objective the promotion of a successful, economic and dependable supply of quality vegetable seeds." Unfortunately, we do not have basic data of production statistics of the current status of vegetable seed production in the country and a survey of vegetable and production will have to be undertaken urgently. A "National Vegetable seed programme" should be formulated and a co-ordination body like "National Vegetable Seed Committee" may be constituted. It is, therefore recommended that a National Vegetable Seeds Corporation be established to take care of the problems of vegetable seed production on a national scale.

To conclude, the Government should ensure that the nation's long term interests are of paramount importance. The farmers should not be carried away by short term remedy like imports, and the seed industry should not restrict its objectives to quick and easy profits.

TOWARDS SELF-RELIANCE IN ELECTRONIC MATERIALS

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'A saga of missed opportunities' - is probably the most apt charactrisation of the history of development of electronics industry in India. Keeping in view its importance, any comparision of electronics with the cases of nuclear or space technology would reveal a glaring contrast in terms of national effort, political will and the response of the scientific community of this country. Was it because electronics and semiconductor technology did not find its Bhabha or Sarabhai? Or, was it simply because it failed to fire the imagination of the elite of the time as a technology endowed with prestige and ostentation for a young nation? The reasons for India missing the bus of the electronics revolution is often sought in the nature of Indian economy and market despite the fact that ours has been a more or less planned and command economy as far as the general direction and infrastructural facilities are concerned. Ever since the importance of a strong electronics industry dawned on our policy makers and planners, precious little has been done from the point of view of attempts at building a self-reliant technological base in electronics.

Though belated efforts to catch up and leap-frog the developments elsewhere did in some measure respond to the growing indigenous needs in terms of components and systems, they have failed in one important respect with which we are concerned - a sound basis for self-reliant growth. The Policy interventions such as of important of technology at the level of components and systems does little to provide the foundation for a self-reliant edifice in a field marked by perhaps the highest rate of change and technological obsolescence. As a general rule, givers of technology take care to drug the takers with addictive dependence. The onus lies on the takers of technology to rid themselves of this addiction. This is most effectively done by an intelligent choice of links in the technology chain via tinkering. As far as the long term goals of self-reliance are concerned it is not hard to see that the technology of the basic electronic materials forms the crucial and the weakest link. With this in mind we focus our attention here on the status of our self-reliance in electronic materials.

The primary raw material for the electronics industry is silicon, not just ordinary metallurgical silicon, but silicon so pure that there can be only one impurity atom for every billion silicon atoms. It is this stringent requirement of purity and perfection that makes the production of the raw material itself an area of high technology demanding equally high standards.

In the world market, 80% of the total demand of silicon is for device quality materia where the requirement of purity is most exacting. The remaining is solar cells either in the form of single crystal or amorphous. The purity requirement for these materials is less stringent. At present the demand for device quality material in India is only of the order of a

few tons per year, primarily owing to the state of development from our miniscule indigenous component industry. However the demand for photovoltaic applications is likely to increase form the present 20 to 25 tons to about 100 tons in the next few years depending crucially on the cost of solar cell modules.

Till recently precious little had been done to develop the indigenous production of this important material, apart from pious statements and restatements of good intentions by a string of committees starting from Bhabha committee report in 1965. Only in November 1981, Govt. of India approved the setting up of a National Silicon Facility (NSF to produce photovoltaic grade polysilicon in the country. By mid-1983, the Department of Electronics decided to import the technology and entered into negoriations with hemlock semiconductors INc., USA to set up a 200 tone per annum polysilicon plant in India at an exorbitant cost of about Rs. 90 crores. However, much before the importance of polysilicon technology was realized by the governmental agencies, scientists from IISc were well on their way in developing the technology indigenously in close cooperation with Mettur Chemicals Ltd. This led to the now too well-known bitter controversy over imported vis-a-vis indigenous technology.

We do not intend to recount the controversy here. However, the very fact that the controversy did occur and the course it ran is worth studying closely since it is a rich mine of important lessons for science, technology and industry in India. Though the participants of the controversy now term it as an ugly episode which was wholly avoidable and unnecessary, it played a crucial role in bringing into focus a number of important general issues:

a) the nature of interaction between R & D institutions and industry - an issue central to self-reliance and Indian S & T effort in general;

b) the nature of vested interests which undermine any serious effort towards self-reliance;

c) the crucial role of the response of scientific community and independent opinion makers; the need for public scrutiny and vigilance of supposedly expert apex governmental organisations.

Thanks to the controversy, an important victory was scored by the indigenous effort in so far as the Hemlock contract was terminated, though at a considerable and useless cost to the public exchequer. At present the indigenous technology has been commercialised at Metkem Silicon Ltd., with an installed capacity of 25 tonnes/annum

There are many specific and positive aspects of this effort that needs to be underlined since it is a good example of the stuff that commitment to self-reliance is made up of. Here is a case where the scientists of their own accord and with institutional encouragement stepped

out of the isolated percincts of academia willing to embark on technological challenges and speak the language of the market, demand and cost. It was fortunate that these scientists found a far seeing management in the cooperating industry and the costs involved were not prohibitively large for a medium scale industrial effort.

The technology involved was not based on some spectacular or classified breakthrough in the laboratory. In fact, the basic chemistry of the unit processes are well known and the capabilities for the most steps in the technology existed in the country, though not quite in the same context and scale. The most important contribution that was needed was to be able to link the various steps in the technological chain, scale them up to industrial level after laboratory tests, and to exercise technological choices from among various possible routes taking into account ground realities. As an example of the latter in this particular instance, a conscious decision was made to base the silicon industry in India on industrial scale production of silicon tetrachloride as feed stock rather than more conventional trichlorosilane. Hence, the infra-structure for producing silicon tetrachloride had to be developed keeping in view the demand for other basic materials of industrial importance linked to this technology, whereas there was practically no possibility of the bulk use of trichlorosilane in India. The ultra-high purification of the materials, the design of scalable reactors for decomposition, recycling of the by-products and developing the process control equipment are some of the technological problems that had to be solved with indigenous effort. It must be noted that such a linked list of problems are no respectors of disciplinary boundaries so characteristic of academia and R & D institutions working in isolation.

At the heart of any such developmental effort, of course, lies a high level of scientific and technical competence and faith in such competence. The technological know-how gathered this way is bound to be more responsive to our needs than can be offered by any packaged deal of imported technology. The key personnel that get trained as participants of such developmental effort are not just skilled appendages to an assembly line of imported machinery but are masters of the technology at work.

This victory for self-reliance in silicon technology in India will ring empty if some of the associated dangers are not taken cognizance of. There is a danger that support to indigenous efforts is sometimes given at the cost of quality. To what extent should such efforts be protected from international competition is a question which need to be answered with discretion. On the one hand there is a need to protect so as to insulate such initiatives from commercial manipulation of foreign suppliers, on the other hand it should not mean protection from competition which can have adverse effect on quality or cost. The success of silicon technology in India is closely linked to the developments leading to self-reliance in the component industry and device technology. A full appreciation and study of this link is needed in the wake of grandiose plans of the Department of Electronics to make electronics a ten thousand crore industry.

On the international scene today, we may be standing at the threshold of another revolution based on electronic materials, which is being termed as photonics. This is rapidly emerging as a field with a large number of applications (specifically in communications) that far surpass the already remarkable achievements of electronics. This time the technology is based on compound semiconductors such as gallium arsenide, indium phosphide and their alloys. The material technology involved is an order of magnitude more exacting than silicon technology. Care must be taken not to miss the bus this time. We believe that plans are afoot to set a large project in gallium arsenide foundry in the defence sector soon, though the details of such plants have not been made public. This is the technology which is going to be central to the optical communications system based on fibre optics. Already technology imports for optical fibres have begun without probably a proper appreciation of the need for the associated photonics technology. The technology is a state of flux and rapidly improving towards its goal of using coherent beams of photons instead of electrons for as many functions as possible. Again here, one must guard against the danger of importing obsolete technology without initiating an all out and consolidated effort towards indigenous R&D and technology development programme.

SELF-RELIANCE IN SOFTWARE-BASED INDUSTRIES - A POSSIBLE SCENARIO FOR FLEXIBLE PRODUCTION AND BATCH PROCESSING SYSTEMS

P. Purakayastha

INTRODUCTION

The advent of micro-electronics has caused a radical change in the industrial scenario. Highly automated systems of production along with intelligent control systems are rapidly replacing older forms of production. Flexible manufacturing systems have made possible automated production even with small job volumes. The chemical industry has also introduced automation and intelligent systems but have yet to popularise the batch counter part of the flexible manufacturing systems - flexible batch processing systems. Nevertheless, there is little doubt that such systems will also make their appearance in the coming years. In the next sections, we shall first identify the nature of change that is currently affecting the global industrial scene and then examine its implications for the country. The final section deals with a possible strategy to position India favourably in the coming decades.

GLOBAL INDUSTRIAL SCENARIO AND THE MICROELECTRONIC REVOLUTION

The industry till the sixties had been dominated by the concept of economies of scale. A larger production capacity was automatically thought to assure a higher output to capital ratio. As the plants became bigger and bigger certain other factors were to upset the assumption that an economy of scale would automatically be the result of scaling up of the plant.

The factors which operated against such an automatic economy of scale were as follows:

a) Rapid technological change

b) Unstable markets and prices

c) Unreliability of large plants

Rapid Technological change introduced an instability in the calculations derived for economy of scale. If the technology for a given process changes rapidly, the output for a given capital investment will also change. As large plants have large gestation periods, the calculation on which he economy of scale is worked out becomes obsolete with the obsolescence of the technology involved or a plant with a large scale capital investment this has obviously very serious consequences.

Traditionally the production process for large metallurgical or chemical process plants did

not change rapidly in the past. Even if a process change took place in the chemical industry, modifying the process was not a very large investment as the equipment involved could still be used with some modifications. The metallurgical processes have been even more stable. For instance the basic steel making process has hardy changed for more than a hundred years. In such a situation, even if process changes are introduced, the capital investments are not rendered obsolute and therefore the assumption of economies of scale remain valid.

The introduction of micro-electronics had led to a radical change in the industrial scene. For the first time, the equipment design itself was being affected by technological change. For instance, improved controls permitted the following:

a) Lower margins on equipment design due to superior control and the ability to maintain pressures and temperatures within narrow regimes meant that design margins on equipment could be reduced.

b) Elimination or reduction of large intermediate storage elements (tanks etc.) leading to more compact plant designs. The intermediate storage was introduced quite often due to the inability to control a complex process rather than any necessity of the process itself.

c) Reduction of material losses in the processes in the area of steel for instance, losses of materials have come down from 20% to 5% from the 60's to 80's.

d) Better utilisation of energy which is a costly input to the system.

f) Use of computerised design techniques resulting in cheaper and better designs.

In the continuous process industries therefore, a change in the nature of process, controls has resulted in a cascading impact on all the areas of the plant. The technological efficiency of the plants changing due to the above, lead to rapid obsolescence of equipment and plants. Under conditions where technological changes are rapid, large investments are an obvious risk.

Unstable Markets and prices have also induced conditions under which large units are at a disadvantage. If the plant capacities are large, they are more sensitive to changes in prices of either the finished product or the raw material costs. The rise in oil prices in the seventies radically changed the economics of oil fired, coal fired and nuclear power plants. Similarly the fluctuation of the cost of finished products like steel in the international market affects the economics of steel plants. While a smaller plant is also affected by the change in prices investments for a small plant can still be considered under conditions of market instabilities. However, investment decisions involving large amounts of capital are difficult till market instabilities subside. Under such conditions the decision to put up a number of small plants with a different product mix so as to minimise risk may be preferable even if the capital to output ratio is not as favourable as it would be for a large plant.

Unreliability of large plants have been an important element in limiting the economy of scale. It has been observed that larger plants are more prone to failure and outages as they encompass very large and complex systems. A system fails at its weakest link. A large and complex system is more likely to have such unintentional weak links. Secondly, the loss of output involved in a large plant can cause major dislocations unlike the loss of a smaller plant. Even if the down time of, for example, three small plants is equal to that of one large plant, the effect of such outages is much less unlike the outage of a large plant, three small plants are unlikely to fail simultaneously.

While the above scenario has been discussed largely with respect to the continuous process industry, it is also applicable to the manufacturing industry. The technological process in the manufacturing industry have also changed radically in the last decades. Numerically controlled tools, use of large scale plant automation, and tying up of the plant production process with the design office via CAD/CAM systems have led to technological instabilities of the kind discussed above. However, added to the above, new materials, new machining process like the use of laser trimming etc. has also led to equipment changes and product changes in addition to the changes in the manufacturing process and design automation.

In the above section, we have discussed the limits of economies of scale and a gradual scaling down of the plants from the earlier elephantine proportions. However, there is also a lower bound of an unit size as the costs of automation and computerised designs are high. As a result the smaller plants are unable to match either the quality of the products or the basic technological efficiencies realised from the micro-electronics revolution. The minimum economically feasible unit size should be such that the plant can be automated to an extent that the products are "competitive" in terms of quality and the process is without a large amount of material wastage. Automation technologies, as they are emerging in the West, are extremely expensive, while the basic hardware costs are not large, the automation system costs and the software costs introduce a very large cost element. Computer aided design and computer aided manufacture are similarly not cost effective for small plants as the lower bound or entry level costs of flexible manufacturing systems and batch processing systems are prohibitively expensive for small volumes of production.

THE IMPACT OF MICRO ELECTRONICS REVOLUTION IN INDIAN INDUSTRY

In India the basic engineering paradigm has been to acquire technology from abroad and at best adapt it. Economies of scale were sought to be built up and it was taken as axiomatic that larger plants had a more favourable capital to output ratio. In the current situation, with fluctuating international markets the Indian Industry is largely restricted to the national market which is comparatively more stable. However, with increasing liberalisation, it is clear that Indian industry is neither able to match the quality of the products being manufactured from highly automated factories nor able to match the prices. Given that automation technologies as existing now are highly capital intensive by Indian standards, the ability of Indian industry

to survive open competition does not seen likely. Protection act, is one way of ensuring th survival of the industry but does not help in improving technological efficiency and product quality to match what is available at the global level.

Indian Industry, whether public or private, has gradual acceptance of an ancillary role to globally dominant enterprises. A certain level of imports have been assumed in the production process and indigenisation only affected for the areas requiring low level skills, Materials, electronic chips, designs, critical components etc are to be imported while other not so critical items are to be manufactured indigteneously certain metallurgical and chemical plants are going in for an automation process more in tune with global automation levels as the Companies concerned are already of unit sizes which fall within the two limits discussed above. However, for a majority of the plants in India, either continuous or manufacturing, such an option does not seem to be open.

The option for the Indian industry within the current technological paradigm would therefore be to seek protection of the market or accept an ancillary level for the forseeable future. An independent path of development would have to consider an alternative technological paradigm and create tools for realising such an alternative. We outline below an alternative technological paradigm and the tools involved.

FIXED STRUCTURE AND VARIABLE STRUCTURE PLANTS IN THE PROCESS INDUSTRY.

Process industries can be considered as a complex of processes. Given a specific product or a set of products, the manufacturing cycle is broken down into a set of constituent "active elements" and a set of intermediate and final storage elements. In a block diagrammatic form Fig.1shows a process plant configured as described above.

The active block above could be reactors, pump etc. - either transportation blocks or blocks which, transform the materials flowing through its. All process plants can be described in this way-as a combination of active and storage blocks.

In the current design of process plants, the plants generally have a fixed structure. For a given product or a set of products the actual process is decided. Once the process is decided, the "active" and "storage" blocks are configured around the specific process. This is a fixed-structure plant with predefined interconnections of the various "blocks". In a fixed-structure plant, economies of scale operate and there is an automatic tendency to scale up the production to reach a more favourable production point. The result is that larger plants have a clear edge over smaller ones. In a given market, the big plants have therefore a competitive edge over the smaller plants if both have fixed structures. However as discussed earlier if there are large instabilities in the market, or rapid obsolescence of products, the large fixed- structure plants can suffer large losses as has already been discussed earlier.

Under such conditions, the investment decision is based not on maximisation of profits but on minimisation of risks and this may preclude investment in large plants.

Hitherto, the technology did not support anything other than fixed-structure process plants. With the advent of micro processors, it is possible to consider variable-structure process plants. In such plants, there will be a set of active blocks capable of operating over a certain process regime. The interconnections would not be predefined, but would depend on the specific process decided by the set of products chosen to be manufactured. These products can then be decided based on current market conditions. The control system would determine the sequence of process to be followed and be capable of operating the plant within certain bounded regimes for such active blocks. The result would be a generic process plant which can be used for manufacture of a number of products depending on the nature of the market and the cost of the inputs. We have here the concept of a variable structure plant and a flexible batch processing system. In block diagrammatic form, such a process will be as depicted below.

In such systems the economies of scale are offset against the flexibility of switching from one set of products to another. The market will affect the operations of the plant, but not lead to severe instabilities of operation, Above all, a new process will not render the plant obsolete.

For a country like India, in which the market is not large enough to have the necessary economies of scale, there are obvious advantages to a flexible batch-processing system and a variable plant structure. A modular approach to plant design may help expanding the plant and its interconnections by adding more modules. The key to such plant design is however a control system which allows control regimes available with large plants as well as their modification/change at a short notice. The switching from one process to another requires a flexibility from the control system and its easy "reconfiguration" or "reprogramming".

It is clear that a mere replica of the plants in the west will result in accelerated technological dependence. The dominant technological paradigm makes it difficult for efficient production at low volumes, either in production costs or in terms of quality. A flexible batch system with low cost automation devices which are "software intensive" may offer an alternative technological paradigm. In such a scenario, the low volumes are offset by the variety of products and the quality maintained by an extremely good control system. The software systems would allow the change of control structures at short notice so that smaller units can be standardised more easily and the unit cost reduced due to such standardisation.

FLEXIBLE MANUFACTURING SYSTEM

The flexible manufacturing systems are already well known in the machining industry. The "marriage" of Computer Aided Design (CAD) with numerical machine tools permits the design and production process to be tightly coupled. Low Volume production can then be profitably undertaken as extensive tooling and design investments are not pre-requisities for starting the production of a new product. In the future scenario it has been suggested that people could walk into an automobile show room, choose custom built parts on a computer screen and have this merged into the production schedule without any effort. In affect, custom built cars would be no different in terms of costs and effort as far as the automobile manufacture is concerned.

The flexible manufacturing system therefore leads to a tight coupling of the computerised design and production control systems to the machine shops. However, the investment in such a set up is quite high. While a company like Nissan can invest billions of dollars in product design and such an automation, even the more humble production units are high investment propositions by Indian Standards.

Design automation and automated machining are necessary to meet the quality of products required by today's industry, However, the investments costs are large and can be justified by a level of market which is not there except for very few products. The result is a growing dependence of the Indian industry on multinationals to provide the necessary tools and the more critical components.

Here also the basic issue remains how to ensure a certain quality of product with the low volumes available. The automation of the entire manufacturing process and the use of such tools are prohibitively expensive for the volume of production. In affect, a new technological paradigm is required here also.

In order to meet the low volume market, it is necessary to switch products. For switching production lines, the automation of entire production line as in flexible manufacturing systems is too expensive a proposition. Instead we propose to introduce few "flexible production elements" in production line such that the requisite quality of the product can be maintained. In other words, the CAD/CAM concept is to be introduced at a few crucial places in the production line while the rest of the production line uses more conventional machining/processing. This will allow the product quality to be competitive while not increasing the cost of production drastically.

The flexible production element has to be designed carefully with the following things in mind:

a) It must be capable of performing a variety of processes.

b) It must be possible to "program" it from the design drawings.

c) The tolerances and products must be comparable to the best in the world.

d) The range of products must be large to compensate for low volumes of each individual product.

Obviously, we are talking here of appropriate technology. But however this appropriateness is derived from the most advanced technologies rather than second hand "hand me down technologies" which are being peddled in the third world by more advanced nations.

In the next sections, we propose to develop the outline of the automation tools which are proposed to be used for flexible batch processing and flexible manufacturing systems.

TOOLS FOR FLEXIBLE AUTOMATION SYSTEMS

We have identified the major elements of a flexible automation system. They are as follows:

a) A variable structure plant which allows change of product mix by changing the process flows.

b) Variable production elements - which allow production of different types of products from one set of machines. The introduction of variable production elements will allow the building of variable structure plants by interposing them in conventional process also.

c) Low cost automation tools which will make it possible to realise different control strategies depending on the current batch of the product mix.

d) Low cost computerised design techniques which will permit rigorous design to meet the quality requirement even for small plants.

The major elements which have to be developed to meet the requirements of flexible production systems for small volumes are cheap automation tools which can be handled by a relatively unsophisticated plant operator and cheap design tools which can be used to "create" such flexible production plants and "modify" them for new process. Here modification really means altering the process flows and checking material specs automatically to see that they match the new process requirements.

Obviously, the major vehicle for the introduction of low cost automation and design tools is to base it on the IBM PC. This is the cheapest and most widely used computer tool that exists and must be the basis for any such automation attempt. The system architecture is well known, external interfaces are easily available, and the system can be easily maintained. We are proposing to modify the system only marginally by adding physical interfaces to the plants using analog to digital convertors and contact inputs/outputs. Even this is readily available for the PC market. Similarly, for the design of the variable plant structure, low cost design tools are readily available for the IBM PC which can be suitably modified. As the design tools are not required for each plant level but only at design centers even more expensive tools at this level can be considered.

In the next sections we will elaborate on these aspects further.

IBM PC BASED AUTOMATION

PC based automation must have certain characteristics if it is to be used in the way we are suggesting. The automation tools must have the following features:

a) A completely non-programming approach for configuration of "software" - automation tasks/reports, human machine interface must be created without any programming knowledge.

b) Total flexibility of the system for introducing new control strategies corresponding to the current product mix.

c) Handling of closed loop and open loop control. Closed loop controls are important in chemical and metallurgical process while open loop controls is central to machine shops and manufacturing systems.

d) Easy graphical displays to monitor process and report generation.

e) Modularity of design so that the system can be expanded to accommodate plant growth and plant interconnection.

The use of IBM PC have already been or monitoring, controls and automation, however, the software already developed does not permit the flexibility and ease of configuration as they are generally developed for essentially fixed structure plants. In such plants, the configuration and software development is done once by people who are already familiar with the software.

The other purely technical problem of using IBM PC is that it is not readily amenable to use in a real time environment. The MS- DOS operating system has serious limitations in this regard.

However, MODULA - an object oriented language with strong real time features is available for IBM PCs and this can be used to overcome the limitation of MS-DOS.

The major element of using a non-programming based automation software is to make it totally menu driven using normal language commands and interactive graphic language commands. This can be realised by using a data base and set of tools which operate on the data base.

CONCLUSIONS

It is not the purpose here to go further in to the technical details of a plan of self-reliance in the software based industries - the realm of high-tech. suffice it to say that a program of action can be taken for developing independently such industries neither as a recipient nation nor in terms of re-inventing the wheel. A new pradigm of development to take into account our national strengths can be found given the will to do so. The problems of colonised minds which refuses to look at anything not developed in the advanced countries is as much a problem as the global dominance of multi-nationals.

Contemporary Developments in Drug Industry

- Amitava Guha.

The situation in the drug industry in recent times has undergone rapid changes. There have been high profile activities from the Transnational (TNC) drug companies to affect the policies involved in the drug industry. Vigorous criticism from the people have influenced the making of policies in many countries. Even WHO had formulated guidelines for drug policy. The greatest concern of the world drug situation has been the rational use of drugs, availability of essential drugs,pricing and quality of drugs. It is evidently clear that drug policy involves a number of policies. In the recent past there has been a deterioration in all spheres of policy and it was found that of all the things the interest of the country was sacrificed first. It is not only a time consuming but most shocking task to unveil the anti-people and pro TNC steps taken by the field of drug industry in the recent past. It is therefore attempted here to reflect some of the important areas where immediate attention is needed to rectify the damage done in areas related to drug policy.

Licensing Policy

On 8th May 1952 Drugs and Pharmaceuticals were brought under the first schedule of the Industries (Development & Regulation) Act. According to this Act all manufacturers excepting the Small Scale manufacturers would require to appeal for a Registration Certificate and Industrial Approval.

Ist instance:

The licensing Committee in 1953 decided the term "New Article" of the IDR Act and the parameters for exemption from Registration Certificate were also decided. Between 1953 and 1966 only 17 TNCs applied for such exemption which proved that all others violated the decision. Therefore, to enforce the I(D&R)Act, the Govt. had to revise the exemption limit for fixed assets of the companies in the following manner.

January, 1964	:	Rs. 25 lakhs	February, 1970	:	Rs. 1 crores
April, 1978	:	Rs 3 crores	August, 1983	:	Rs. 5 crores

2nd instance :

The act was again violated. The Govt. had to undergo a make shift arrangement to glorify the laws, and exemption was provided under carry on Business licence. The objective was :

"In the case of an industrial undertaking required to be registered under Section 10 of the

I(D&R) Act which has not been registered within the time fixed for the purpose of carrying on business of the undertaking after the expire of such period"

3rd instance :

In 1980 the Department of Industrial Development appointed a Special Task force for studying the rampant violation of the licensing system. On 17th October, 1981, the New Industrial Policy was announced. The policy provided, recognition of excess industrial capacity or Recognition of Excess Production (RIP) over the licensed capacity. This was done in violation of the Drug Policy of 1978 where it was stipulated that all foreign drug companies will have to produce bulk drugs to the extent of at least 20% of their total sales turnover.

This liberalisation of the Govt. was also violated. Scrutiny by the Govt., in 1982 showed that nineteen foreign companies produced 211 items without any valid licence. Therefore, the ultimate alternative was delicensing.

Delicensing :

The industrial policy declaration of 1980 stated that the principal aim of licensing is:

a) Utilisation of of indigenous capital and materials for increased production.

b) To meet the requirements of national priority

c) To ensure uniform development of the industry

d) Import Substitution.

The 1978 Drug Policy imposed a sectorial reservation for the production of Drugs. 108 bulk drugs were declared as reserved in the following manner.

Only for Public Sectors	-	17 bulk Drrugs
Only for Indian Sectors	-	27 bulk Drugs
Open for all Sectors	-	64 bulk Drugs

This provided tremendous incentive for the development of the technology and the production of essential drugs by the Public Sectors and Indian Sectors, which was correctly observed by National Drugs and Pharmaceutical Development Council. Against such observation, Govt. acted "keeping in view of the need to stimulate industrial growth and simplifying the industrial licensing policy and procedures". On March 16, 1985 the Govt. declared a scheme of delicensing. At that stage and in June 85, 82 drugs were delicenced.

The position was :

Life saving category	18 drugs delicenced
Essential category	10 drugs delicenced
Marginally Essential Category	52 drugs delicenced.

Reservation for both Indian & public sectors was confined to only 18 drugs!

In the meantime, the Indian sector has developed technology for at least 66 bulk drugs of which twenty two were delicensed.

The consequence of delicensing was such that the TNCs jumped to procure for those reserved bulk drugs and prempted the production capacity of many. This has not helped the improvement of production. It was found that of the 90 monitored bulk drugs a slight improvement was found in the production of 13 drugs and only seven bulk drugs were produced more than the target but all others were under produced till 1986-87. Therefore the shortfall of production had to be made up by import while TNCs under utilised their capacity. The Govt's. vulnerabality to TNCs interest were further accentuated by the decision of broad banding, which was for the first time made applicable to the drug industry. This allowed the TNCs to manufacture at least 100 more drugs without obtaining any licence. Despite all liberalisation the production of essential drugs showed a very little improvement. (Table-1).

FERA Liberalisation:

Pointing out the inadequacy of the Foreign Exchange Regulation Act 1947 the 47th report of the Law Commission on "Control and punishment of Social and Economic Offences" mentioned:

> The nature of economic offence by foreign companies was peculiar as they were planned and executed in secrecy by shrewd and dexterous persons or sophisticated means greatly affecting public welfare, but detection is unusually difficult.

Based on these findings of the Law Commission, the public Accounts Committee in 1968 recommended that the Govt. must take measures to repair the leakage of foreign exchange occurring in the course of imports and exports of goods through invoice manipulation by appropriate legal measures. Accordingly a Foreign Exchange regulation Bill was introduced in 1972. The objective of the bill was to consolidate and amend the laws regulating certain payments, dealings in foreign exchange securities, transaction indirectly affecting foreign exchange and import and export of currency bullion and its proper utilisation in the interests of economic development of the country. It was further assured that the effect of the Act would be reviewed and amendments would be made if the measures are proved inadequate. But always reviews were made and changes were enforced contrary to the interests of the

country.

According to Sec. 29(2) of the foreign Exchange Regulation Act 1973 all companies (other than banking) incorporated abroad or where non-resident involvement was more than 40% as well as branches of such companies were asked to obtain Reserve Bank's permission to carry on their activities. But the Appendix-1 of the Act enlisted the "Drugs and Pharmaceuticals industry in a totally unrestricted manner".The Hathi Committiee criticised this position and recommended that

a) The multinationals should be directed to bring down their equity to 40% and further progressively reduce it to 20% and that too should be done in such a manner that the majority of the shares are diluted to the Government Financial institution to avoid dispersed holding of the shares.

b) To nationalise the multinational corporations.

The drug policy of 1978 could not do much in this aspect but declared that ',multinationals who were engaged in production of formulations only are required to bring down foreign equity to 40% forthwith.This was also violated by multinationals at ease-thereafter the Govt decided that no pressure would be imposed on those multinationals who involve high technology in production. In reality a large number of the Indian drug companies employ high technology in the manufacturing process. The OPPI then aopopealed to the Govt. for extension of Article 14 of the Constitution of India to multinationals. The Govt. assured them that "Equality of law" would be provided although this evoked strong protest from the Indian drug companies. But the multinationals started diluting shares little below 40% and this evoked strong diluting shares little below 40% and thus became India Companies. Thus in 988, excepting six all TNCs operating in India became Indian companies and freely started grabbing the facilities enjoyed by purely Indian companies.

This is ridiculous in the sense that even in most of the developed countries the definition of foreign companies are very strict. In Japan, France, Australia, companies having more than 0% to 20% of non-resident equity capital are considered foreign companies.

The pattern of equity dilution of TNCs are also dear that they retain absolute decisive power. For example, May and Baker retained 40% of Rs. 45 lakhs shares and the remaining 27 lakhs share are distributed among 61,314 share holder. The other way of retaining power by the parent company is that they had not changed the 'Memorandum and Article of Association' nor had the Government taken care in this respect.

The following articles which will be found in almost all companies memorandum provides the absolute power to the parents which have

Power to appoint one third of non-relieving Director

Power to appoint and remove Managing Director

Power to appoint and remove Chairman of the Board of Directors

Power to veto any resolutions by one of the ex-officio Directors

Besides, the Chairman is usually given a second or casting vote. These apart, th memoranda are usually found to have a clause that no resolution shall be deemed to b passed by the Board or Committee, unless a Director designated for this purpose from th parent company cast an affirmative vote in favour of the resolution. It is evidently clear that n Board can function in detriment to the interest of the parents who are the none but th supreme policy makers. yet TNCs are considered as 'Indian Companies' by our Govt.

As a result the principal observation of the 47th Law Commission of foreign currenc manipulation remains unaltered. The following illustrations will establish it:

1. The out go of foreign currency by way of repatriation has increased (See Table).

2. Balance of export and import is not only negative but the outgo of hard currency ha increased (See Table)

3. The import of raw materials to produce inessential and OTC. drugs have increased.

The other danger the TNCs pose is that the potentially large Capital base of them alon with a liberal licnecing policy have put the Indian companies to face most unequa competition. The TNCs in India have generated a large equity base and a very large reserv capital which had increased debt/equity ratio to such an enoromous extent (See Table -) tha no Indian Company can stand against such powerful capital base.

Company	Original equity	Shareholder' Fund	Borrowing	Equity Debt ratio	Borrowing power
GLAXO	0.02	47.36	7.90	1;0.18	79.62
Warner	0.70	5.30	1.32	1;0.25	9.30
Burroughs	0.05	15.27	3.17	1:0.21	27.37
BOOTS	0.10	8.88	2.96	1:0.33	18.80
RICHARDSON	0.002	6.53	2.50	1:0.38	10.56
RECKIT	0.30	10.97	-	1:0.00	21.94
CIBA	0.03	10.64	8.64	1:0.20	73.21

Pricing Policy:- Pricing plays a major role in determining profit in pharmaceutical industry. Increase in price effects much more in profit generation than decrease in manufacturing and marketing expenses. These drug companies always try to increase the prices of drugs even though they had faced a bitter criticism all over the world for over pricing. In 1970 Haffman-La-Roche preferred to pay 1.6 million to British Govt. than to reduce the excessive selling price of Vallium and Librium. But it was estimated by the Monopoly Commission that Roche made a profit of £4 million from the sale of 6.8 million of these two drugs in that period.

Prices of drugs generally falls due to the expiry of patent and increase of economy of scale so long as its consumption keeps expanding. We have seen the prices of Cholomphenicol came down to 50 paise from Rs. 12/- in 1950 for each capsule. In recent past same happened with Rifampicin, within the span of five years prices came down from Rs. 5000/- to Rs. 2500/- per kg. of the bulk drug. Yet the Govt. was convinced of the industry's argument that prices of drugs has not raised in comparison to that for commodities. It is also falsely claimed by OPPI that the prices of drugs are cheapest in India. We find that landed cost of finished formulation of essential drugs are higher than those of the indigenous products. It is applicable in the case of bulk drugs. Imported bulk drugs are mostly cheaper than the indigenously produced ones. This is a major reason for the drug companies crying for more number of drugs be put under OGL.

Drug Price Control Order (DPCO) 1979 imposed price control on 487 bulk drugs in three categories. The TNCs reacted in different ways to thwart the price control measures. They went to court and procured injunctions for stay against Govt. Order. They openly violated Govt. order by less or no production of essential basic drugs. The TNCs campaigned that they are not able to earn profit by producing the drugs in India due to DPCO. It will appear from table that most of the TNCs improved their performances in the years 1986-87 and 1987-88 and excepting six, all increased their assets. Aggregate gross profit of the industry was found to be 17.4 percent during this period. Under these circumstances the Govt. compromised with the Industry and declared new DPCO in 1987. It was properly observed by WHO in the world Drug Situation (1989), Already prior to the new Drug Price Order the prices of all drugs showed a 30% mark-up and drug company shares were selling at a premium". While declaring DPCO'87 the Govt. could not clearly define date criteria for categorisation. They only listed 26 drugs in category but left the selection of Category II drugs under a Committee. Although the Govt. said in DPCO'87 that the principle of keeping the drugs under category-I will cover all drugs required under National Health Programme but in reality they considered only six out of eleven diseases covered under National Health Programme.

Prior to fixing the list of drugs under Category-II there was intense lobbying by the industry aiming to keep as many drugs as possible beyond the price control category. As a result, we find that the TNCs have by and large enjoyed excellent exemption from price control. Table will show that the 18 top TNCs functioning in India enjoyed price control exemption ranging from 30% to 98%. It is is also interesting to note that the Committee for

selection of Category-II drugs prepared certain criteria of which we find that the committee itself violated all these criteria while selecting the drugs. It was found that a large number of drugs like Vitamin A Vitamin C. Chloropamide, Indomethacin, Clonidine, Hydralazine etc. were left. The Committee declared that drugs with a turn over-more than 50 lakhs per year would come under price control. But this was not made applicable to drugs like Dulcola (Sales Rs. 146 lakhs) Cremafin (Sales Rs. 218 lakhs) Aristozyme (Sales Rs. 340 lakhs) ostocalcium Syrup (Sales Rs. 331 lakhs).

The Committee also decided that no monopoly or near monopoly drug would be left out of the list. But drugs like, Neosprin, Dilosin Benedryl, Haemaccel, Zolandin, etc. which maintain almost monopoly share in sales were not considered. The Committee selected 140 drugs in the Category-II list. This also could not please the industry. Protest came from all of them. In the last one year 13 more drugs were dropped from the list and 20 others are in active consideration. The Govt also shifted a no. of drugs from Category-I to Category-II. This is not all. The Committee had to prepare another report in the mid 1989 which virtually recommended price de-control.

The system of leader price is enjoyed by the TNCs who are mostly brand leaders of the high turn over drugs. The other partners in the industry also follow the leader price but provide trade incentives at a high rate.

Therefore, the consumers are in no way benefited by this system. There was a system of price equalisation and a fund was maintained under the head Drug Price Equalisations Accounts. This fund was abolished. In Supreme Court TNCs were convicted as charging over Govt.recommended prices. They were ordered to refund the excess profit earn to DPEA but fund stand abolished It is surprising to know that DPCO'87 had allowed these TNCs to increase price of almost all drugs for which they were convicted. The other area which contradicts the national interest is the cancellation of pooled price system.

The recent move of the industry which has almost convinced the Govt, is total abolition of DPCO and 'Self regulatory price system' would replace it. The Secretary of the Pharmaceuticals Dept. has already announced that the Govt. is in favour of it. The other concern is that in recent past all new drugs introduced are not only of too feeble nature but also a very high price. Some of them cost Rs. 99 per capsule and Rs. 160 per vial of injection. We need to analyse whether we need them at this moment. Development of Science and Technology was ruthlessly suppressed in India during the colonial period and the most important device used was the Patent System 1948. At the initiative of Nehru "Patent enquiry committee was formed under Justice Baune teckchand. This recommendations were placed by then Minister Shyama Prasad Mukherjee who also tried to introduce a bill in 1953 to change the Act. Later, in 1957 another Committee was formed with Justice N.Rajagopala Ayengar and the Chemical Technologist Dr. S. Venkateswaran. They prepared "Report on the revision of the patent Law". Based on this report attempt was made to introduce a new Patent

Act. which was successfully stalled by TNCs for 12 years. M.P. Jr. Zoachim Alva complained that "More than 30 foreign drug companies have declared an unholy war against this bill".

Ultimately, the bill was passed and Indian Patent Act, 1970 was born. This Act. has greatly helped the Indian Drug Industry to grow. It does not allow any patent for drugs. Patent is applicable only on process technology that too for a period of maximum seven years. This has helped us to introduce a number of drugs before their global patent expired. Technologically Indian Companies were free to develop technology for a large number of drugs for which international patents were to expire much later and they actually produced and marketed these drugs. To-day horizontal transfer of technology helped a large number of small companies to produce bulk drugs some of whom are involved in export also. Similarly, the national research laboratories also developed a number of technologies for bulk drug production. This would not have been possible in the absence of india Patent Act. 1970.

There has been move from some quarter to change Patent Act and pressures are created to join Paris Convention.

The proponents of this change are suggesting that this Act. has been a block for import of modern technology. But they have suppressed the fact that the technical collaboration agreements by Indian companies have increased from 183 in 1970 to 1041 in 1985. The phramaceuticals out of 41 technlogical collaborations during 1979 to 1985 Indian companies were involved in 39 cases where the Indian patent act has not played any restrictive role.

Brazil raised the question of an international patent policy in the 16th General Council of U.N.O. in 1961. In 1972 UNCTAD Conference at Santiago decided that clauses of Paris Convention would be changed in favour of the 3rd World Countries.

The UNCTAD draft prepared in 1975 was opposed by a Group of 7. In the conferences held from 1979 to 1985 despite opposition from only two countries the draft was approved. The whole matter was taken in GATT. Question of Trade related intellectual property (TRIP) was raised. Brazil was blamed for the reason that they had kept pharmaceuticals out of patent system.

In Geneva Conference of GATT, India surrendered by accepting to Pumta-Del-Este resolution that in order to make TRID available national laws will be made available. This betrayal and surrender to the pressure of U.S. will ultimately result in the changing of patent Act in favour of the interest of TNCs causing a great harm to self reliance and unlimited price escalation will follow in quick succession.

Import policy: Policy regarding import has been criticised by both the industry and consumers, We find that there has been world wide criticism of the TNCs for utilising transfer pricing arrangement for earning high profit. The TNCs in India have been ignoring the import

restrictions put on bulk drug, intermediate and other raw materials. On many occasions they were either importing bulk drugs from their own parent organisations and charged a higher price of the same bulk drug in our country while they have not utilised the production capacity installed at their own factory in India. In 1978 drug policy cananlisation of import was encouraged but later it was discarded in the mid eighties. The Table shows how the TNCs have earned money by simple transfer pricing. A difference of Rs. 24,338 per kilogram becomes enoromous when tonnes of drugs are improved in 1987-88 import of 42 bulk drugs were shifted from restricted items to General license category. Out of the 42 drugs, only 6 drugs were life saving and essential and 10 drugs had no price control, having unlimited profit potential.

Bulk drugs like ibuprofen, pyrazinamide, Corticosteroids, Ephedrine, Methyldope, Ibuprogen, Pyrazanamide, Corticosteroids, manufactured here but import is also allowed. Many TNCs who enjoy monopoly over these drugs do not produce them here as import is allowed and therefore enjoy an excellent scope of utilising transfer pricing system.

Import of Refampicin has been in large quantities and is exempt of excise duty. Inspite of the technology being available in India it is difficult to produce bulk drug as 105% import duty imposed on the raw materials., Some instances of similar cases are given below.

Bulk Drug	% of Duty	Intermediate/raw-materials	% of Duty
Trimethoprim	1'00%	3, 4, 5 Trimethoxy benzaldehyde	134%
Refampicin	nil	Raw materials	105%
L-Dope	nil	Vanillin	135%
Sulphadiazine	100%	Intermediate	135%
Chloroquin	nil	Ethozy methylene diethyl malnate	25%

This indicates that the present import policy is discouraging not only production but also develpment of indigenous technology.

Occupational Health : An attempt at a Framework for the AIPSN

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Occupational Health as the term implies, is or at least ought to be, concerned with all aspects of the health of those engaged in occupations. Unfortunately, this might be too wide a definition, and for our purposes, we might narrow down our consideration to the health of workers as it is affected by their particular occupations.

"Occupation" or "work" can affect health both positively and negatively - something that is lost sight of when we talk about occupational disease or work related disease. Work can affect health in many ways:

A. The most important, of course, is that work provides the means for the fulfillment of basic needs - food, clothing, shelter, etc. The degree to which these needs are fulfilled defines the main beneficial effects of work, and to the extent that they are not, work fails in its main health promotive function.

B. Exposure to specific physical, chemical, and "ergonomic" factors in the workplace can have a negative impact on the health of the worker. These effects may be due to high-level exposure as in accidents, or chronic lower level exposure, as in the case of occupational or work-related disease. This relationship, between specific factors at the workplace and the development of certain syndromes has been the focus of most studies on occupational health.

C. Both, the degree of fulfillment of basic needs and the nature/organisation of the work process as a whole, can affect the worker's perceptions of control over his or her life, and a general feeling of satisfaction or a lack of it, which, in turn, may lead to health promotive or destructive behaviour.

So far, most workers' struggles have been limited to the first of these - i.e., the struggles for higher wages, "job security" etc., and understandably so, for certainly the fulfillment of these basic needs is the sine qua non of workers' health and that of their families. However to construe the fulfillment of these needs as guaranteeing health, of course would be a fallacy. just to illustrate, one can look at certain mortality statistics of England and Japan, two countries which include occupational data in their routine mortality statistics.

In Japan, in 1970-72, (where at that time to question of "basic needs" may be considered to have been largely settled), Standardised Mortality Rates (SMR) for males aged between 15 and 64 years, show that miners and quarrymen had the highest mortality rates (more than 50% above the mean for all occupational groups), followed by farmers (About 25% higher than the mean), Service sports and recreation workers, transportation and communication workers, sales workers, clerical workers (just below the mean), "other workers"

and craftsman, artists professional and technical workers and finally administrators and managers (The last with an SMR more than 50% below the mean for all occupations). The SMR of miners and quarrymen was, therefore, more than three times that of administrators and managers! The same was true for cause specific standardized mortality rates: suicide rates were more than 50% above the mean for farmers, followed by miners and quarrymen; mortality from cerebrovascular diseases among miners and quarrymen was more than 25% above the mean; that from malignant neoplasm of the stomach from accidents, poisoning and violence among miners was more than 509.9% above the mean, followed by farmers, more than 50% above the mean, coversely, cause specific standardized on mortality rates for suicide, cerebrovascular disease, malignant neoplasm of the stomach, accidents poisonings and violence, ischamic among administrators and managers followed by professionals, technical workers and artists. The same was true for still birth rates except that the rate among professionals was marginally lower than that among administrators and managers.

The trend in England at that time was similar, except that the magnitude of the differences was smaller.

These data are mortality data, and are only part of the story, and yet they clearly show that even after the satisfaction of basic needs (which were probably satisfied to a great extent in most members of the different occupations mentioned above, in these two countries these two countries by the 1970s), there remains a wide gap between the health and well being of those engaged in actual production, and those in more privileged positions. Thus, one's position in the work process still determines one's health.

In India, we have very limited data regarding occupation related morbidity and mortality. Though accidents and occupational diseases are notifiable, and compensable, reported figures in official statistics are absurd. Yet one may see some trends:

Table - I : Accidents and Injuries:

	Accident Rate 1000 workers reported under			
	Factories Act	Mines Act	Workmen's Compensation Act.	
Year	Fatal	Non-Fatal	Fatal	Fatal
1940	0.13	22.14	0.96	—
1950	0.1	30.96	0.6	—
1955	0.1	42.44	0.64	0.31
1960	0.13	47.67	0.49	0.31
1965	0.14	49.11	0.42	0.33
1970	0.14	67.42	0.43	0.26
1975	0.14	45. 5	0.95	0.33

The above figures show that there has been a trend towards increased non-fatal accidents, while fatal accidents reported under the different acts has been rather constant. The large difference between the deaths reported under the Factories Act, and those reported under the workmen's compensation Act is also evident; The reasons seem self-evident: in the latter case, the workers' dependents would have to file a report of death if compensation is to be claimed, while in the latter, the factory owner, or the factory inspectors have no personal interest in reporting the death (if any, the owner has every reason not to report, and he can often give the factory inspector a "number of reasons" not to do so).

Reported cases of Notifiable Diseases

Year	Factories Act	Workmen's Compensation Act
1970	42	73
1975	27	91
1979	12	91

These figures are clearly absurd. However, to get an Idea of the magnitude of the problem one can look at some data based on small surveys:

A study in 1981 (Kamat et.al) showed a prevalence of byssinoosis of the order of 14% in carding, 10% in spinning and 11% in winding sections of a cotton mill. At around the same time an NIOH study showed a prevalence byssinosis of around 5% among all textile workers, and other investigators, rates as high as 50% in carding departments, and 20% in blow rooms.

86% of tobacco workers involved in cultivation and harvest showed "green symptoms" in one NIOH study while another NIOH study showed a reduction of pulmonary function among most female workers involved in tobacco processing.

ICMR reports rates of up to 34.1% for silicosis in Bihar mines, up to 45% for pneumoconiosis in coal mines. (Quoted in Qadeer and Roy, 1989)

Other surveys show rates of asbestosis of 6.5-30%, silicosis 16- 57% and lead poisoning, 9% in different occupational groups (Quoted in Qadeer and Roy 1989).

Dinesh Mohan, using data obtained from rural Punjab estimates about 316,000 deaths, and 2.5 million crippled every year from accidents (Quoted in Qadeer and Roy 1989), while others estimate that there are over 37,000 cases of byssinosis among textile workers, more than 1400 cases of asbestosis among asbestos workers, and over 500 cases of lead poisoning among lead workers, annually.

While these estimates must be based on selective data, and while one may question extrapolation from narrow surveys, they are at least illustrative of the magnitude of the problem of morbidity and mortality related to the work process.

Some of the Hazards Present in Industry

Agriculture: Accidents like snake and animal bites, and mechanical trauma from use of machinery and equipment; effects of heavy work in awkward positions; hazards associated with pesticide and fertiliser use (including exposure to lead, phosphorus and its compounds, manganese, arsenic, DDT, halogenated hydrocarbons etc.); exposure to dusts leading to allergy, etc., and biological hazards (e.g. anthrax),

Mines, Quarries Foundries, Slate Making: Mechanical trauma, heat, effects of heavy manual labour on the neuromuscular system; Silicosis; asbestosis; Pneumoconiosis; Cancers associated with coal and coal products, asbestos, arsenic, mining of iron, uranium, etc.

Metallurgy, smelting, Production of Alloys: Effects of heat; noise; mechanical trauma; effects of heavy manual labour; exposure to lead, manganese, arsenic, chromium; silicosis (in stripping and relining of furnaces; exposure to chlorine bromine, flourine, beryllium, carbon monoxide; cancers caused by arsenic, chromium, nickel benzopyrenes, etc.

Textiles/Garments: Heat in the presence of high humidity; noise; mechanical trauma; "postural effects"; effects of mercury and its compounds, manganese (in dyeing and bleaching), Nitrous fumes (in bleaching of Rayon), carbon disulphide (in the production of viscose rayon), chlorine; byssinosis; skin cancer caused by cutting oils and lubricants.

Chemical/pesticide/dyestuffs/pharmaceuticals: Heat, noise, mechanical trauma; exposure to lead, manganese, phosphorus, benzene (Associated with a plastic anemia and Leukemia); hazards associated with specific pesticides; Vinyl chloride (hepatic toxicity, and development of angiosarcoma of the liver); chromium, chromates, arsenic, nitrous fumes, polycyclic hydrocarbons; specific effects of pharmaceutical products, etc.

It is just not possible to give an exhaustive list, but this shows the wide variety of potential hazards associated with the production process - and make it clear that there must be significant morbidity and mortality associated with hazards present in the workplace.

Given the multitude of hazards present in the workplace which may affect the health of the working population, it is clear that the factors that led to increased risk, and the approach to prevention will vary according to the hazard. One, can, however look at the relationship between these hazards and the worker from the point of view of traditional epidemiology.

Agent ----------host

Factors affecting Agent

Factors affecting host

Factors affecting relationship between host and agent

Factors Affecting the Agent: Factors affecting the agent - in this case "agent" refers to the particular hazard in question probably the most important in determining the occurrence, or otherwise of occupational or work-related disease. For, by definition, the agent is the primary cause of the disease caused by it. The factors which affect the degree to which the agent is produced, or the "concentration" of the agent (analogous to the "population" of a biological agent) will vary from agent to agent, but again some generalizations may be made.

A. **The Choice of Technology:** The choice of technology is the main determinant of the type of hazards present in the workplace. This seems obvious. For example, the adoption of "Green Revolution" technology and the decision to use High Response Varieties of grains, automatically implies the use of fertilisers and pesticides. Once the decision to use pesticides has been made, then the specific method of application, would determine the amount of pesticide that is discharges into the environment etc. (by analogy with infectious agents, this can be seen as similar to factors which influence the reproduction of the biological agent in the environment).

B. **The Choice of Equipment:** While the prime determinant of the hazard present is the specific production process chosen (and in fact the products chose), the specific design of machinery, etc., also influences the presence or otherwise of the hazard, or at least its degree. For instance, the decision to use mechanical threshers, automatically introduces the hazard of mechanical trauma into the process of threshing, but a longer feeding platform would be associated with reduced danger, while a shorter feeding platform would be associated with greater danger.

C. **Maintenance of Equipment and Machinery:** The presence or absence of a hazard, or its degree may be determined by the maintenance of equipment and machinery. Leaks, and loose parts etc., can increase hazards, from chemicals, noise, trauma etc., while proper lubrication of moving parts, etc., can reduce noise.

D. "**Intensity**" of the production process: Generally all other factors being equal, the more intense a production process, the greater is the chance of the presence of hazardous factors.

Factors Affecting the Host: A number of factors can increase or reduce the susceptibility of disease causing agents. These factors may be many: genetic, nutritional status. "personal habits", physical capabilities, sex, age, capability etc., are among the factors that can affect the suspectibility of the worker to agents in the workplace. These factors, however can be overemphasised (As in the so called pre-employment examination). For, though it may be true that for some hazards (for example) moderate neuromuscular stress) the biological or other characteristics modify susceptibility to hazards in the workplace, the nature of these hazards is usually such that no human beings may be considered to be reasonably "immune" to these hazards.

Thus, all persons exposed to noise over 80 db will, over a period of time develop deafness, and there is not identifiable characteristics, the presence or absence of which would be associated with a lack of susceptibility to this effect of noise. All human beings are susceptible to the effects of pesticides: embryos and fetuses may be at greater risk, but no one may be considered to be free from risk.

Overemphasis of this aspect - that is blaming outcome on the characteristics of the host-is part of the Victim blaming ideology". The most glaring example of this is the attempts in the USA to blame the symptoms of byssinosis on the smoking habits of victims, with the claim that it is mainly smokers noise, All human beings are susceptible to the effects of (Interestingly, in the early years of the research into the relationship between smoking and cancer, attempts were made to attribute the observed effects to the differences in the living and working environments of cases and controls).

Among the factors which affect the susceptibility of the host to the harmful effects of the agent two must be specially mentioned: Age and Sex.

Age: Child labour is a bane of our society, and the problems of children are obviously special, children are more susceptible to the effects of many environmental hazards. For example, at the same levels of lead in the environment, children absorb significantly more lead per kg. body-weight than do adults. Also, while they may suffer from the same harmful effects of hazards in the workplace as do adults, thee is one effect they are susceptible to, which is not a problem in adults: interference with growth and development. Thus, levels of exposure to hazards which may be safe in adults may not be safe in children.

Sex: Similarly, women, besides being susceptible to the hazards and effects that men are susceptible to, are also susceptible to "reproductive" effects when pregnant. Thus exposures which may be safe for adult males may not be so for the embryos and fetuses of pregnant workers.

Factors affecting the relationship between agent and host: for any agent to cause disease, the host must be exposed to the agent in sufficient "dosage". Thus even if technologies "produce" or are associated with the presence of hazards, whether they cause disease or not will depend on: a) whether the worker is exposed to the agent, and b) to what

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degree the worker is exposed. (There are many who will argue that there is no such thing as a threshold as is implied by the statement).

Among the factors that can affect the exposure of the worker to the hazardous agent are many. Factory layout is one such factor: the use of noise-proof control cabins may reduce exposure to noisy machines, while in small overcrowded workplace, there may be increased hazard from noise, heat, dusts, as well as increased danger of accidents. Ventilation may reduce the concentration of various dusts in the workplace, humidification may increase the harmful effects of heat, etc.

The use or otherwise of personal protective devices may also affect the exposure of the worker to the hazards in the workplace - these devices may range from gloves to protective clothing, to ear muffs, masks and breathing apparatus, etc.

From this "traditional" framework of the relationship between agent, host and disease, one can arrive at a hypothetical approach towards prevention of these hazards at the workplace - again using traditional framework of "primary prevention"' "Secondary prevention" and "tertiary prevention/rehabilitation".

Primary prevention: Primary prevention may be loosely defined as preventing the initial harmful effects of the agent on the host. Traditionally, in the case of infectious agents, this has consisted of elimination of the agent to the extent possible reducing exposure of the host to the agent through the use of quarantine, isolation, vector control, treatment of vehicles etc., and of course, increasing the resistance of the host to the agent, through improved nutrition, immunisation of the host to the agent, through improved nutrition, immunisation of the host to the agent, etc., In the case of occupational hazards immunization of the host to the agent is not possible (Except in the case of infectious hazards, and possibly, IgE mediated allergic reactions [hyposensitisation]), but otherwise, an analogous approach might be postulated (hypothetically, of course: later we shall see the problems with this).

The most obvious preventive measure would be choice of technologies which do away with the hazard, or have the least possible production of the hazard, where this is possible. For instance, in the control of crop pests, one may rely entirely on pesticides, or choose some method of integrated pest management. Where different technologies are available, to produce what it has been decided to produce, the production of hazard must be a criterion in the choice between technologies. This of course, would be the most ideal approach.

Where a particular production process has been chosen, the specifies of design of the equipment may be so set as to minimise the hazard - the case of the mechanical thresher has already been mentioned. Often, it may be possible to build in "safety" features in the design of the equipment itself.

Then, of course, proper maintenance of equipment and machinery would also reduce hazards in the workplace - for example, where leaking boilers with loose fittings are both a

noise hazard, and an accident hazard, repairs would go a long way into reducing the production of these hazards. Lubrication of with moving parts to reduce noise hazard is another obvious example.

Where it is not possible to limit the "production" of the hazard, steps may be taken to reduce the exposure of the worker to the hazard. This may be at the plant level, or at the personal level (analogues to environmental sanitation and vector control on the one hand, and measures like isolation, or home based methods of water purification, on the other).

Some examples of a plant-based approach to reducing the exposure to hazards present at the work-place are: separation of the more hazardious processes from the less hazardous ones to reduce the number of workers exposed to the hazard as in the separation of noisy processes from the less noisy ones; noise proof control cabins for processes which are noise hazards, so that the workers have to go up to the machinery for and repair; proper ventilation and layout of a textile factory might reduce the concentration of cotton-dust in the atmosphere; using a wet process may reduce the production of silica dust in stone quarries; where explosive are used. organising the work process so that workers do not go to the area of the explosion for at least five to six hours after the explosion would also reduce workers' exposure to silica dust.

These measures should serve together to reduce the exposure of workers to these hazards to levels below those which would lead to negative health effects with chronic exposure. These levels might, or might not be the same as the so-called "health based occupational exposure limits" developed by expert committees of WHO ILO etc.

Where this is not possible, then the use of personal protective devices may still reduce the workers' exposure to hazards to levels below those which would cause significant harmful effects. The use of personal protective devices is not a very satisfactory method of reducing the exposure of workers to hazards in the workplace. There a lot of problems in the use of personal protective devices; ear-muffs interfere not only with noise, but also with useful sound and may even increase the danger of accidents by reducing sounds which may warn the workers of an impending accident, and they may also cause contact dermatitis; rubber gloves may interfere with operation which require dexterity, any may also increase the dangers of accidents, unless properly designed; masks may not be adequate enough to protect against particular hazards, and may give a false sense of security to the worker; so-called protective clothing, in a tropical country, may actually increase the hazard from high temperatures; personal protective devices are generally uncomfortable, and this discomfort itself may interfere with concentration, increasing the risk of an accident where concentration on the part of the workers is necessary to prevent one.

In the case of prevention of infectious diseases, primary prevention also includes increasing the resistance of the worker to the agent. In the case non biological work related hazards there is no equivalent of immunisation. It has already been stated that the nature of hazards associated with the work environment is such that all persons may be considered to

be susceptible to most hazards. However certain features of the host may be controlled to minimize some specific hazards.

A. Age, One cannot wish away child labour, so long as the conditions necessitating the engagement of children in productive labour remain. However exclusion of children from certain jobs which involve exposure to hazards, and those which require concentration to avoid accidents, etc., is warranted.

B. Sex, Similarly, since women are more susceptible to certain hazards, or more correctly their embryos and fetuses are, women must be given special protection so as to avoid the teratogenic and other harmful effects of factors in the workplace on fetuses and embryos.

C. Education: The degree to which a worker uses protective devices may, to some extent, be dependent on his understanding of the hazards present at the workplace, and how they may be avoided by the use of personal protective devices. To the extent, and only to the extent hazards can be avoided by the use of protective devices, and lack of awareness of hazards and of proper uses of personal protective devices is responsible for non-use or improper use of these devices, education of workers can play a role in primary protection.

D. Skill of workers: A number of processes are inherently dangerous, and even if much skill may not be required in working with them, skill and practice may required to be able to do them safely. In such instances, ensuring that only skilled full-time regular workers are involved in these processes would be an important part of primary protection.

E. General health of the worker: workers who suffer from conditions which greatly increase the risk associated with hazards present in the workplace might have to be excluded from jobs associated with these hazards.

Secondary Prevention:

Secondary prevention involves early detection of the conditions caused by the agent, and the taking of measures before significant disability has developed, to prevent further progression of the condition.

In the case of work related, or occupational diseases, this would mean regular check-ups with the specific purpose of identifying early symptoms/signs suggestive of early stages of the condition likely to be associated with the particular work process in which the respective workers are involved.

For example, this might involve checking for early signs osteoarthirtis/spondy lists

among workers involved in heavy manual labour, or work which involved prolonged assumption of awkward postures: regular audiometry for workers exposed to noise: pulmonary function tests and chest x-rays among workers exposed to respiratory hazards; regular testing for biochemical effects of chemicals where such are known,etc.

Early detection may then lead to change of work, or the making of changes in the work process to reduce the hazard, or, where possible, taking curative action (for example, the use of chelating agents to help eliminate heavy metals).

This would, of course require the presence of occupational health services, specifically geared towards the detection of conditions likely to be associated with the work process (which would vary according to the work process).

Tertiary Prevention where primary and secondary prevention fail, then it might be possible for health services to prevent death or permanent disability, or failing the latter, to provide some rehabilitation - to ensure the return to a state as close to full health as possible.

Tied-up with the question of tertiary prevention and rehabilitation is the question of compensation - as the need for tertiary prevention implies that the health of the worker has been damaged, for which he/she should be compensated.

Unfortunately, this idyllic state of affairs - of a world with functioning mechanisms for primary, secondary nd tertiary mechanisms does not exist. What is the reality?

I. The primary determinant of the occurrence or otherwise of work related or occupational disease is the choice of technology all the technological decision made, from the choice of what to produce, to that of the production process, the selection of specific machinery and equipment, the design of the plantpremises, the organisation of the work process as a whole,to the use of measures to reduce the presence of hazards in the workplace. All the factors relating to the "agent" and to the relationship between the host and the agent, other than the use of personal protective devices have to do with choice(s) of technology.

But, what are the determinates of the choice of technology? Certainly not workers health. Here are some of the more glaring examples:

Thresher accidents leading to the loss of limbs are a common occurrence in agriculture. Now, on a thresher, the worker pushes the grains towards the cutting blade along a feeding shute, and the longer the feeding shute, the less the danger of the workers hand reaching the knife. In 1979, the ISI set the standard that the feeding system should be not less than 90 cm, of which not less than 45cm should be covered. These standards were later reduced, with the rationalization that Indians have short arms, to 50 cm and 25cm respectively.

In the pharmaceutical industry, automatic packing machines can reduce the exposure of workers to chemicals, but are often not used because of the availability of cheap labour to do the process manually.

The adoption of green revolution technology obviously had little regard for worker' health. And this cannot be blamed on a lack of appreciation of the possible effects of pesticides and fertilizers on workers' health - for increasing use of these is still encouraged. There is still official scorn for such things as integrated pest management.

The official scorn for development of alternate sources of energy - or at least the fact that not much effort is made in this direction - is another example.

What is the primary determinant of choice of technology, and how does this conflict with the interest of workers' health? This is probably the central question of occupational health as, finally, it is the choice of technologies which determine the exposure of the worker to hazards in the workplace. It is also this choice of technologies that influences the other ways in which work is related to the worker's health. Other factors such as the personal protection of the worker, and the provision of health services for early detection of work-related conditions are only secondary in the determination of workers' health.

There will probably be many answers to this question - as many as those attempting to answer it. At the risk of resorting to a tautology, one can say that the overall developmental strategy of the country will ultimately determine, in a broad way, the choice of technologies adopted in society.

The centerpiece of our developmental strategy, of our planning strategy is: Economic Growth, Continuous growth in economic production is the prime concern of all investment strategies, of all investment in production. Everything else is secondary to economic growth which is seen as being necessary merely for the survival of our economy. The dominant view seems to be that with economic growth, with increases in production, welfare will be guaranteed, or at least that it is necessary, if not sufficient for the welfare of our people. It is probably true the given our present level of economic productions and consumption, it might not be possible to improve the living standards of the vast masses without increases of production in some areas. To this extent economic growth is a valid national objective. However, if often seems that growth becomes there must be a continuous increase in production to merely assure the survival of the society, and its structure. Even in the case of the socialist countries, stagnation in economic growth seems to have played a part in the recent upheavals, even in countries like czechoslavakia, and GDR where basic needs were more than met.

Where a society needs continuous economic growth to merely avoid crises, the question of the effects of technological changes on workers' health must necessary take a back seat.

Thus with this emphasis on growth - whether it is built into the system itself, or whether it is needed for the legitimate purpose of increasing consumption of the most deprived sections of society - all those supporting growth are willing to sacrifice considerations of workers' safety and health, for the sake of increases in production.

While the need for economic growth provides the impetus for the investment in technological production, the specific technologies chosen are influences, or may be influenced by the following "constraints"

Maximization of profit: The drive behind private investment is the profit motive, and as such investment in technology would be considered only if it brought profits. In such circumstances, investment in technologies, or adoption of measures that protect workers' health will be considered only if it means increased profits - either from increased productivity or from less interruptions to work, or from improved labour relations. Thus, in one pharmaceutical company manufacturing nitroglycerin in Bombay, management was willing to consider workers' demands for an automatic packing to protect them from exposure to the substance only on the condition that the investment be tied-up with a guarantee of increased productivity per workers.

Investable surplus deficiency: Ours is after all a country which is deficient in investable surplus. This accentuates the problem for the worker: where funds for investment are scarce, then - either for the sake of the goals of national development, or for the sake of maximization of profit - all, or at least a very great proportion of investment is geared towards maximizing production.

Foreign Investment: The lack of investable surplus in our country means that, given our goals for increased economic production, we have little bargaining power with regard to foreign investors. All investment is seen as "good" as to increases economic production. Also whatever steps are taken to regulate foreign investment, are taken from the point of view of maximizing available investable funds (i.e., from the point of view of conserving foreign exchange). Neither environmental, nor work hazards are an important consideration, Thus, the tendency is to shift those production processes which are most labour intensive, and often the most hazardous to third world countries, including India.

Terms of Trade:

A. Between developed and developing country: India, as a developing country is a trade deficit country, and needs all the exports it can get to finance imports, and ostensibly, development, unfortunately, third world countries have little opportunity to get into the "high-tech" and "high-value" markets of developed countries. The markets, are primarily for primary products or for manufactured products whch are "high0tech" third world countries have little opportunity to get into the "high-tech" Given the competition in the international market, there is built into the system a

needs to keep costs as low as possible. This necessitates as intense an exploitation of labour as possible, increasing the hazards at work (by intensifying the work), and interferes with any significant investment in workers' safety. Also, this need to export, and the encouragement given to all forms of export may encourage investors to invest in the manufacture of those products which are not manufactured in the developed countries - and this may include those whose manufacture is associated with levels of hazard unacceptable in developed countries.

B. Between the Urban and Rural "Sectors": Within the country the rural sector, with its emphasis on production of low-priced primary products - the price of which must be kept low by the state, to minimise dissatisfaction amongst an already burdened urban population - and its dependence on high-priced manufactured products from the urban sector, increases the problems for rural workers. This imbalance leads to the need to produce more - with increasing exploitation of land, adoption of "green revolution" technologies, in turn increasing the dependence on the urban or industrial sector, with even more need for cash....

The increased intensity of work, with the increased use "green revolution:" technologies leads to increased hazards for agricultural workers.

Pressure from labour: One factor which can influence investment priorities in ways which are beneficial for the health of labour is pressure from labour itself. Unfortunately, here too, in an economy with a scarcity of jobs, and where remuneration of labour is so low, there is a conflict between the need of the workers, or potential worker for the creation of more Jobs, and rises in wages etc., on the one hand, and the need for the investment in measures which will protect the health of the worker, on the other. This contradiction aside, there are other factors which affect the bargaining power of labour, in influencing investment in technologies which minimise damage to workers' health.

Supply of Labour: The main factor influencing the bargaining power of labour is the surplus of available labour in the country, with a continuous increase in this supply. This obviously puts pressure on those who have jobs, as there are others willing to work for a pittance. Thus, job security becomes an overriding concern. Also, this means that for management labour is not a scarce resource which has to be preserved. Thus, management does not have tp even worry about subsistence of labour, leave alone it reproduction. (The rural sector takes care leave alone of this "reproduction" of labour, and, given the phenomenon of "gloating migration" continues to take part in subsistence of labour, and in providing "Social security".

Hierarchies within labour: Within labour itself there are hierachies. The most obvious of these is the division of labour into permanent labour and contractual/casual/marginal labour. The latter may account for over half of labour in industry. Often, where there is discontent, or unrest over hazardous duties at work,

among permanent labour, these duties are entrusted to contract/casual labour. This blunts the demands of organised labour while the production process remains hazardous.

One cannot discuss hierarchies within labour without mentioning two groups which are at the bottom of the ladder: women and children. In keeping with their low status in society, these groups, in general, retain this low status at work, and are not able to articulate demands, so that they are often used for jobs that require little skills, and are often hazardous. The use of child labour in sivakasi, and the hazards which women in the tobacco industry are exposed to are only some of the examples

Fragmentation of labour: Even where labour is organised, it is fragmented. The number of different labour unions, and their inability to work together for the cause of workingmen, are common knowledge. This obviously interferes with the ability of labour to influence investment choices. In fact, this fragmentation, with competition for support from labour, often makes is possible for management to co-opt groups representing labour.

These are some of the factors which interfere with the ability of labour to influence technological choices which will, at least, be neutral from the point of view of workers' health (health here being used in the narrow sense of freedom from work related hazards). Until labour wrests for itself the right, or the power to have a greater say in investment, and in the choice of technologies, one can expect that workers' health and safety will continue to be a peripheral consideration in investment decisions.

The role of Legislation: Given the fact that the need for economic growth is a, if not the major determinant of government policy, one can expect that any legislation to ensure that the design of the production process takes workers' health safety into consideration, would be inadequate. It is therefore not surprising that it is so. Among the laws which govern health and safety at the workplace are the Mines Act, 1952, the Factories Act, 1948, The Plantation Labour Act 1951, The Beedi and Cigar Workers Act, 1966. They do not cover all forms of employment.

The Factories Act, for instance does prescribe details of cleanliness, disposal of wastes and effluents, ventilation and temperature, dust and fume, artificial humidification, over crowding lighting, drinking water, laterines and urinals and spittoons. It also lays down specifications regarding working machinery, meant to protect workers, specifications without personal protective devices. Statement governments are empowered personal protective devices. State governments are empowered to declare a manufacturing process hazardous, thus prohibiting women and children from working in the process, besides allowing for regular check-ups, etc. There are also prescriptions for inspection, and for legal action. However, such action can only be taken by the Factory Inspectorate. As already mentioned, management can give the Inspectorate "many a reason" not to take action. Workers themselves cannot directly seek redress for violations of safety regulations in the workplace. Where there are convictions, the fines prescribed are so low as to be absurd.

These laws, therefore do not have the teeth which will ensure that investment decisions will take workers' health and safety into account.

Secondary Prevention:

Secondary prevention involves, as has already been mentioned, early detection of the damage done by hazards in the workplace (in the "pre-clinical" stage, so to say), so that further progression to overt illness will be avoided. This, however, requires the presence of an occupational health service which is beholden to the interests of the worker. Given the question of compensation, and what it means to management in hazardous manufacturing processes, occupational or general health services beholden to management would disinclines to diagnose "occupational disease" even in the florid stage, leave alone early in the course of pathological change where the cause may not always be obvious.

Thus, for instance, in a colliery town Madhya Pradesh, a doctor recommends drinking of alcohol to wash down soot-which will, according to him, prevent its harmful effects. In the same town, doctors even declared a person suffering from spinal injury as fit to work, while another who has lost an eye was told that he ought to be thankful that he has the other eye left.

A doctor associated with the Gwallior Rayons factory in Madhya Pradesh, contoured "allegations" about impotence among workers-a possible result of peripheral neuropathy caused by carbon disulphide, a potent neurotoxin-with the statement that he too lived in the same area-and could satisfy two women, why just one.

And, neither does this failure to link clinical conditions with occupational factors have to be due to a conscious effort on the part of the doctor to protect management. Medical education and practice are such that doctors are just not in the habit in linking clinical syndromes with occupational factors. For example, a review of cases in a Bangalore Hospital, showed about 40 cases of Mesothelioma in the hospital in a little over a decade. No attempt was made to connect these cases with exposure to asbestos-and the link between asbestos exposure and mesothelioma is probably one of the best known associations between occupational factors and a disease!

To make matters even worse, even the law is skewed: Under the Mines Act, a doctor who detects an occupational disease and fails to subsequently diagnose and prove the same to the Chief Inspector, is liable to prosecution under the Act!

ESI: A form of health service which is available to some workers- those who are permanent and fall within a certain salary group (currently less tha 1600 p.m.). Unfortunately, this functions as a general" curative, and does not play the role of a true occupational health service. Thus its role in secondary prevention, if any is minimal.

Tertiary Prevention/Rehabilation: Again, those who are insured under the ESI have some form of "tertiry preventive services available. However, the emphasis, again, has been on

general services (the value of which cannot be discounted). and the coverage of these services is minimal.

Compensation: There are two laws under which workers may claim compensation. They are the Workmen's Compensation Act, 1923, and the Employees' State Insurance Act.

In the case of both these acts, the underlying "philosophy" is "compensation" for lost earning capacity. There are a number of ways in which these are loaded against labour. The following are some examples:

Since compensation is merely of loss of earning capacity only dependents can claim compensation, in the case of death. Thus, for instance, a worker who is killed at work, and his only Surviving relative is an adult male child, who is employed, the latter may not claim compensation, and management goes scot free! Or, in the case of a child labourer who is killed at work, relatives who claim compensation have to prove dependence. Again, it is possible for management to go scot free.

Management may require a medical certificate from a doctor of its choice. though the law stipulates that the cost-has to be borne by the employer, giving him this right certainly gives him a loophole to say the least.

Workers who are insured under the ESI may not claim compensation under the Workmen's Compensation Act. While compensation amounts may be same, what this Act effectively does, therefore, is to transfer responsibility from the employer to the ESI corporation.

In the case of permanent partial disability, the worker has to prove that not only is his ability to perform the job he was engaged in at the time of the accident affected, but also that his ability to perform all the jobs that he could have performed at the time of the accident has been affected.

The formulas for computation of compensation are very complicated, so that the worker may have no idea of the amount of compensation he is entitled to, and is thus easily "bought out" by the employer for a much smaller sum.

There are also other examples about these suffice to show the inadequacies of the laws concerned with this last resort of the worker when all else has failed. This however, should not be surprising. For, the state will protect the interests of the worker, only in so far as it reflects the interests of the worker ("chicken or egg"), and is effectively controlled by the worker.

Role of the AIPSN: Given this situation, it is clear that there are no immediate prescriptions forthcoming, which would ensure significant change in the health of workers. Some points may however be kept in mind:

A. The need to associate with working class movements. Many attempts by groups to take action regarding workers' health have tended to bypass existing unions-with the assertion that inertia, economism, bureaucratism, etc., plague these large unions. Whatever may be the problems with some of these large organizations, the fact remains that unless these unions take up the cause of workers' health, all efforts in this area are doomed to be drops of water in an ocean. (This is not to says that involvement of these unions guarantees that it will be otherwise, for the causes of workers having to accept hazards at the workplace are, after all, structural).

Education of workers can have some effect, but it must be directed. and must include education on legal rights of workers. For instance, even after a worker has accepted a lower sum, as compensation, than he is entitled to, and signed documents, he may still sue for the full amount.

Education of health professionals, and raising of their level of awareness, seems to be another avenue-though this will necessarily fall within the purview of secondary prevention, which is not the ideal to aspire for.

Sporadic attempts have shown that, in the case of organized labour, when workers are made aware of specific method to minimise certain hazards at the workplace, and of steps that can be taken to minimise these hazards, without jeopardising their jobs, they do act.

Finally, though, it must be said that real change in the workers health conditions is dependent upon a basic change of the worker's place within the production process, and his control over it. And, these require basic changes in the country's political and economic system.

THE INDIAN FAMILY PLANNING PROGRAMME: A RETROSPECTIVE

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I shall today review the evolution and growth of the Family Planning programme in India, tracing its twists and turns, its dark shadows, and the few brightly illumined areas. I hope thereby, merely to raise some issues for debate. This will then be primarily a descriptive essay, in order to map out our arena of discussion.

The beginnings of a birth control movement in India can be traced to the last decades of the 19th century. The interwoven ideas of the scientifically decrepit eugenics movement and the birth control movement won early converts among influential sections of the population; indeed several prominent Indians were associated with the work of the Neo-Malthusian League founded in England in 1877. (1) In the Presidency towns of Bombay, Calcutta and Madras, these advocates of birth control, drawn from the cream of Indian society, gathered strength in the first quarter of the 20th century, in consonance with similar initiatives in the U.S.A. and the U.K. The first well known public advocate of family planning was P.K. Wattal, who published his book **The Population Problem in India** in 1916, advancing the view that a reduction in birth rates was a precondition for a rise in the standard of living of the people. (2) This now familiar view of "population explosion" as the cause of Indian poverty conveniently ignores the fact that the "population explosion" is a relatively recent phenomenon : in the Indian subcontinent it dates back to the twenties and made its statistical appearance only on comparison of the censuses of 1921 and 1931; while stagnation of the economy existed for decades before. Between approximately 1860 and 1910, the per capita income at 1948-49 prices is estimated to have increased from Rs.169 to Rs. 220 approximately a rupee per year. (3) To resume our story, the first family planning clinic in India was opened in 1925 by Professor Karve. (4) The Neo-Malthusian Leagus was founded in Madras in 1928. (5) In 1930, the world's first government sponsored birth control clinic was inaugurated at the behest of the Maharajah of Mysore. (6) Madras followed with the establishment of birth control clinic in state hospital in 1933. (7) In 1935, in Bombay, the Family Hygiene Society was established. It brought out a journal quaintly entitled **The Journal of Marriage Hygiene.** In thee same year, Margaret Sanger, the messiah of mechanical birth control, undertook a triumphant nationwide tour winning friends and influencing people. One such, Lady Rama Rau, invited her to address the All India Women's Conference. (8) In 1938, under the inspired leadership of Lady Rama Rau, the First Family Hygiene Conference was organised in Bombay. (9) Also in 1938, the Indian National Congress established a National Planning Committee under the chairmanship of Jawaharlal Nehru. The deliberations of one of its sub- committees (10), chaired by Dr. Radhakamal Mukherjee, was devoted to the question of population. The sub-committee categorically stated that the state should adopt a family planning policy in thee interests of social economy, happiness of the family and the development of the nation. In the sub-

committee on health under the chairmanship of Col. Sokhey, (11) Lakshmibai Rajwade forcefully argued her case for the inclusion of "birth control, provision of goods, instructions, demonstrations and consultations" in maternal and child health services. Birth control, she argued, "is obviously a very important function in view of the fact that the high mortality among mothers and children in this country is in part due to too frequent pregnancies involving a terrific strain on the nerves and on a vitality already abnormally low. Children are born not as a creative evolutionary response to the vital urge, but as brittle standardized products of a tired reproductive machinery automatically set in motion by the sexual act. The reproductive system has to be kept fresh and vitalised to respond creatively and must not therefore be subjected to that strain. That can only be done by controlling pregnancy by contraceptive methods."

We find, thus, two compelling-if not necessarily complementary- concerns shaping the emergent population policy. The first relates to these benefits to national development, viewing population growth as one of the major determinants of poverty, the familiar neo-Malthusian refrain; and the second, the benefits accruing to women's health through birth control. While not contesting the latter, it is nevertheless important to note that this emphasis on women as reproductive beings whose "tired reproductive machinery is automatically set in motion by the sexual act" serves to focus attention on reproductive behavior and not on its socio-economic determinants. It is then sought to alter the individual's behavior through medical technology directed towards a woman whose reproductive profligacy is posited as a cause for her poverty and ill health.

The Health Survey and Development Committee, commonly known as the Bhore Committee, (12) was established in 1943 to provide a blueprint for the development of health services in the country. Noting that declines in birth rates had not followed declines in death rates, the Committee concluded that India was indeed faced with a population problem with grave consequences as"uncontrolled growth of population would outstrip the productive capacity of the country. The Committee therefore recommended that the state should assist the birth control movement , both on the grounds of the health of mothers and children, and on economic grounds in the interests of the individual and the community. The imprint of the eugenics movement is obvious in the Report's observation that "the classes which possess many of these undesirable characteristics are known to be generally improvident and prolific. A continued high birth rate among these classes, if accompanied by a marked fall in the rate of growth of the more energetic, intelligent and ambitious sections of the population, which make much the largest contribution to the prosperity of the country, may be fraught with serious consequences to national welfare."

In 1949, the Family Planning Committee was formed in Bombay; in 1951 it was renamed the Family Planning Association of India, with Lady Rama Rau as president. The FPAI takes credit for playing "an active role in inducing the first Planning Commission to incorporate family planning in health". (13)

The First Five Year Plan (14), however, cautiously observed that "It is not possible to judge whether or not an increasing population is favorable or unfavorable to development. In the past, periods of rapid economic development have also been periods of rapidly increasing population, but whether there is any causal relationship between the two,or how it works one cannot say with any certainty. In periods of rapid development and changing techniques it is questionable whether the concept of 'optimum' population can have any precise meaning." This caveat notwithstanding, the Plan adds that "The pressure of population in India is so high that a reduction in the rate of growth must be regarded as a major desideratum. To some extent, improvement in living standards and more widespread education, especially among women, will themselves tend to lower the rate. But positive measures are also necessary for inculcation of the need and techniques of family planning."

The official programme for family planning was launched in 1952 with a modest budget of Rs. 65 lakhs; health obtained Rs. 65.2 crores (representing 3.3 per cent of the total outlay). (15) Let us note in parentheses that the allocation for health was much below the "irreducible minimum" of ten per cent recommended buy the Bhore Committee. India thus obtained the distinction of being one of the first nations in the world with an official family planning programme and policy.(16)

The Ford Foundation takes modest credit for playing an "active and innovative role" in these developments. In 1952 Ford's representative in India informed the Prime Minister, Jawaharlal Nehru, that his organisation considered India's rapid population growth a major problem and was wailing to consider appropriate aid in this field. (17)

The year 1952 was also significant in that Lady Rama Rau and Margaret Sanger launched the International Planned Parenthood Federation in Bombay. The IPPF has been a major force behind the family planning movement across the world. (18) Again, let us note parenthetically that the major share of IPPF funding came from the U.S. Agency for International Development, the Ford and Rockefeller Foundation and the World Bank. On the board of IPPF sit representatives of Dupont Chemical, the U.S. Sugar Corporation, General Motors, the Chase Manhattan Bank, Newmont Mining, International Nickel, Marconi RCA, Xerox and Gulf Oil. (19)

The National Family Planning Programme received funds from several private international agencies; the Ford Foundation granted nine million dollars. Ford's involvement, it is stated, "firmly established the Foundation in India as an 'innovator working in the threshold of programme development' in the population arena". Ford helped create two of the major Indian family planning organisations, the Central Family Planning Institute (later christened the National Institute of Family Planning) and the National Institute of Health, Administration and Education. (20)

The Second Plan document noted that "regarding population growth only a few observations seem necessary. Rates of population growth can be altered only over a period, and in planning for a limited period, one has to go by results of trends which commenced earlier. Nevertheless, over a period, the outcome of developmental effort can be noticeably different if population trends are altered in the right direction. This is one of those fields in which traditional modes of thought and behaviour are apt to offer considerable resistance to rational approaches and not many countries can be said to have any definite population policy at the government level. Yet these modes or attitudes are changeable and are probably changing faster than is sometimes realised. The logic of facts is unmistakable and there is no doubt that under conditions prevailing in countries like India, a high rate of population growth is bound to affect adversely the rate of economic advance ands living standards per capita. Given the overall shortage of land and of capital equipment relative to the population as in India the conclusion is inescapable that an effective curb on population growth is an important conditions for rapid improvement in incomes and in levels of living. This is particularly so, if one bears in mind the fact that the effects of improvements in public health and in the control of diseases and epidemics is to bring about an almost immediate increase in survival rates. While there may be differences as to the likely rates of population growth over the next 20 or 25 years, indications clearly are that even the utmost effort which can be made-and has to be made-at this stage to bring down birth rates, population pressure is likely to become more acute in the coming years. This highlights the need for a large and active programme aimed at restraining population growth, even as it reinforces the case for a massive developmental effort."(21)

In the Second Plan, the allocation for family planning increased to five crores; the allocation for health was Rs 225 crores, out of a total outlay of Rs 4672 crores, is.e. 0.10 and 4.8 per cent respectively.

Perusing these developments over the first two Plan periods, there appears to be a clear shift of perspective and emphasis on the issue of the relationship between socio-economic and demographic variables. The First Plan noted that it is not always possible to judge the relationship between these related phenomena; the perspective is clearly one that envisages demographic changes as dependent variables responding to wide- ranging shifts in social-structural factors. It does not indicate, therefore, that manipulation of fertility alone would be either necessary or feasible.

The Second Plan, on the other hand, indicates that population growth is an independent variable, and economic change, a dependent one. It is, possibly, not accidental that precisely this change of perspective was current in the field of demography in the U.S.A. during this period. Earlier efforts at understanding so complex a phenomenon as population dynamics and socio-economic change had undergone a transformation into one wherein demographic trends are viewed as determinants of economic trends, and rapid population growth as a

cause of under development in third world countries. (22)

The operational strategy of the family planning programme in the first two Plan periods was influenced buy the approach of the international planned parenthood movement. (23) The family planning clinics that were set up emphasised person-to-person instruction on contraceptive methods, based on the credo that it was physically possible and morally desirable for couples to control the size of their families, and that a small number of children in a family is good for the society whose general welfare is endangered by too rapid a growth in population. (24)

The Health Survey and Planning Committee (the Mudaliar Committee) Report (25), published by the Ministry of Health in 1961, observed that the recommendations of the Bhore Committee in relation to family planning were "faltering and half-hearted". The Committee recommended that "if the family planning movement is to produce early and successful results, it has to be in the nature of a mass movement", and outlined steps towards strengthening the programme. Of greater interest is the supplements to this Report. (26) A minority recommended the consideration of"appropriate legislative and administrative measures" in view of the urgency of the problem, to ensure a fall in the birth rate of the country during the next five years. The measures suggested included graded tax penalties from the fourth delivery onwards, withdrawal of maternity benefits for those refusing family planning, limitation of government services to three children per family and abortion for socio-economic reasons.

The minority Report forebodes in a sense, the shape of things to come: the iron hand of coercion beneath the velvet glove of rhetoric.

The Third Plan document thus awarded "very high priority to family planning" and noted that " the objective of stabilising the growth of population over a reasonable period must be at the very centre of planned development. In this context the greatest stress has to be placed in. the Third and subsequent Five Year Plans on the programme of family planning. This will involve intensive education, provision of facilities and advice on the largest scale possible and widespread popular effort in every rural and urban community."(27)

The outlay for family planning in the Third Plan shot up to Rs 50 crores, representing 0.6 and 4.56 per cent of the total outlay respectively. A burgeoning of the programme took place; the family planning programme took wing.

However, the limitations of the clinic approach were now coming to light. In 1963, the Director of Family Planning, advised by a Ford Foundation consultant (28), initiated a reorganisation. The reorganised scheme emphasised extension education and greater availability of contraceptive supplies.

The adoption of the extension approach led to a massive expansion of the programme organisation. (29) At the grassroots, the subcentre staffed by an ANM was to be the "infantry of the programme." Military metaphors abound in family planning literature and, alas, do not remain confined to scholarly commentators). The Central Government committed itself to bearing the entire expenditure to family planning programme. (30)

As steps were being initiated to implement the reorganised programme, the United Nations advisory Mission visited India in 1965 and suggested the launching of a "Reinforced Programme" parallel to the Reorganised Programme. (31) Three courses of section were recommended, viz an energetic lop programme, an intensified sterilization programme and the promotion of the use of condoms through wider availability via commercial channels. It has been noted that "the designer of the IUD, Mr. Jack Lippes, and other foreign experts visited India and were instrumental in persuading the Government that it was suitable for widespread use. The First UN Mission had a major role in this respect."(32)

The Mukherjee Committee (33), which was established at the behest of the newly established Central Family Planning Council in 1965, noted that "on account of the IUCD method becoming available, a mass programme has become feasible on account of this method's very great clinical and administrative advantage over sterilization." The Committee recommendations, they proudly noted, were in line with those of the Evaluation Report of the UN and of the World Bank. Besides recommending a programme emphasising IUCDs, the Committee recommended the establishment of mobile sterilization units and the sanction of incentives. (In a dexterous sleight of hand, incentives are referred to as"compensation for the individual".)

In 1965-66, the Programme Evaluation Organisation of the Planning Commission evaluated the implementation of the family planning programme and made far ranging recommendations, again in line with recommendations of the world Bank and the UN Advisory Mission. (34) The administration at the Centre was strengthened, a Central Family Planning Organisation was established, and the position of the Directors General of Family Planning in the Ministry was enhanced. The Ministry of Health was accordingly rechristened the Ministry of Health and Family Planning.

In short, the Third Plan period witnessed the burgeoning of the family planning programme even as it showed several shifts of policy, strategy and emphases. Family planning, as shaped by currently fashionable technology, came to dominate concerns in the field of health and shape the directions of health policy.

Due to the serious economic crisis plaguing the country, Five year Plans were abandoned in favor of Annual Plans between 1966 and 1969. This, however, was not allowed to affect the family planning programme. (35) Indeed financial allocations continued to

increase. During these family planning obtained Rs 75.2 crores and health Rs 140.10 crores, compared to Rs. 24.9 crores and Rs. 255.9 crores respectively in the Third Plan. (36) (The discrepancies in the figures are not explained in the Plan documents.)

In April 1966, family planning was withdrawn from the purview of the Directorate General of Health Services, and constituted into a separate Department of Family Planning in the Ministry of Health, Family Planning and Urban Development as it was then called. (37) It has been suggested that this step was taken primarily to impress the world Bank and other aid giving agencies with a view to obtain greater financial support. (38)

The world Bank, in this period, was increasingly interested in the population policies of developing countries who were prospective borrowers. "All such activity (in regard to the family planning programme) arises out of the concern of the Bank for the way in which rapid population growth has become a major obstacle to social and economic development in many of our member states. Family planning programmes are less costly than conventional development projects."(39)

Again, in line with the recommendations of the first UN Advisory Mission of 1966 that the Directorate of Family Planning "should be relieved from other responsibilities such as maternal health and child health and nutrition," MCH activities were delinked from family planning in order to enable field workers to concentrate on family planning.

Enthusiasm for the IUCD now ran so high that policy makers and academics were beginning to calculate how many years the programme had to continue before the"problem was eradicated". In 1966-67, over 900000 women were fitted with IUCDs; in the followings years the number declined to 6,69,000 and from then on the decline was quite drastic. In other words, the IUCD programme was a dismal failure.

Following trails in 1967 and 1968, the Nirodh Marketing Programme was launched in September 1968. Inspired by a marketing specialist from M.I.T., the scheme utilised the marketing outlets of Brooke Bond, Liptons, Indian Tobacco, Hindustan Lever, Tata Oil Mills and Union Carbied to reach a potential retail outlet of over two million. (40) In 1967, the ICMR recommended the introductions of oral pills on a trial basis.

The assumption over these years appears to be that family planning was a necessary outcome of contraceptive technology, and that sufficient unmet demand existed among the primarily agrarian population of the country. This latter assumption was, no doubt, strengthened by the plethora of dubious KAP studies undertaken over this period.

All these initiatives notwithstanding, the Fourth Plan document noted that the problem of population had, in fact, grown even more acute. (41) The Plan accordingly held that the family

planning programme had assumed national importance warranting the highest priority. "Population growth thus presents a very serious challenge. It calls for a nationwide appreciation of the urgency and gravity of the situation. A strong purposeful Government policy supported by effective programme and adequate resources of finance, men and materials is an essential condition of success." (42) It therefore proposed to aim for the reduction of the birth rate from 39 per thousand to 25 per thousand within the next 10- 12 years.

The Draft Plan outlay of Rs 300 crores was raised upward to Rs 315 crores so that the programme could be strengthened and speeded up. (43) Health obtained Rs. 433.5 crores out of a total outlay of Rs. 24,882 crores, i.e. 1.26 and 1.74 per cent.

The Plan proposed "to set up the target of śterilization and IUCD insertions and to widen the acceptance of oral and injectable contraceptives."

In short, a sense of urgency mounting to hysteria was created. The pace of the family planning programme was substantially accelerated. (44) A sterilization target of 14.9 million was fixed; the efforts of the family welfare centres for vasectomy operations were to be supplemented by more than a thousand mobile service units attached to district family planning bureaus.

Thus vasectomy came to occupy centre stage of the programme. Several"ingenious initiatives" were undertaken. Dr. D.N. Pai established a vasectomy clinic described as "one of the most successful of the early programmes" (45) at Bombay's Victoria Terminus to cater to the railway passenger traffic, estimated at 200,000 daily, Inspired by Pai's work in Bombay, Mr.S.S. Krishnakumar, Collector of Ernakulam District, stake his claim to enter the annals of sterilization history. He organized a "historic vasectomy camp" in the town hall of Ernakulam, where, in "a festive atmosphere", over 15,000 vasectomies were performed in a month. (46) Six months later, a second camp was organised wherein 63,000 vasectomies were carried out. The World Bank, the UNFPA and SIDA supported these"dynamic" initiatives with considerable funds. Indeed there was considerable excitement in New Delhi, New York and Washington when, against a target of 30,000 vasectomies, the Collector achieved 63,000.(47)

The Department of Health and Family Planning, convinced of the efficacy of the Camp Approach, encouraged the states to holds camps. Gujarat managed to steal Kerala's thunder by achieving 160 per cent of the annual target in little more than two months. (48) Districts were encouraged to compete with each other, and associations such as the Chambers of Commerce and the Rotary vied with each other to assist in the establishment of camps.

By 1972-73 most states were holding camps, though in several states where attempts were made to hold repeat camps the performances was disappointing. At a camp in

Gorakhpur (U.P.) in 1972, eleven vasectomised men died of tetanus. (49)

In 1972/73, 31 million sterilizations were performed in India, a peak exceeding previous years and two thirds accounted for by camps. In 1973/74, the figure was down to 0.94. By 1974, despite statements in favour of a suitably modified camp approach (56), the Department of Health and Family Planning had abandoned its emphasis on the camp approach. This was partly a result of the disasters, as in Gorakhpur, and the consequent setback; it was also partly due to the difficulties experienced in sustaining the camp approach and the financial stringency of the period.

Meanwhile, in 1971, the Medical Termination of Pregnancy Act was passed, and the All India Hospitals Post Partum Programme was launched. In addition to these initiatives, the Government of India, in collaboration with USAID, launched the Intensive District Programme. (51)

In short, the Fourth Plan periods witnessed desperate efforts to consolidate the family planning programme, even as evidence mounted of the inability to do so. The period also saw shift in programme strategey and emphases as we saw in the Third.

Nevertheless, towards the end of the Fourth Plan, it was increasingly being realised that approaches hitherto adopted had not yielded commensurate returns. It was been noted that "in 1974 the family planning programme had reached a stage of financial and even philosophic disarray. With the total number of acceptors in 1973-74 down 27 per cent on the previous year, things looked gloomy for the programme."(52)

With great hesitation, it was being realised that contrary to the claims of the KAP studies, there was widespread resistance to the programme; and that this was rooted in the poor health and nutritional status of the population, and the extreme and pervasive poverty in the country.

This shift in perspective was, possibly, coincidental with the growing awareness among international agencies of the failure of the family planning approach to poverty, highlighting the need for a broad based, "development" approach. The World Bank, under Robert Mcnamara, was one of the early converts, as indeed was John D. Rockefeller. (53) In addition, for a variety of reasons, foundation support to demography had shrunk dramatically; apparently the stock market collapse of the early 1970s which "dramatically affected" their finances played a key role. The USAID and Ford Foundation phased out their support. Financially lean and fitter, "demographers in the U.S.A. had come to emphasise social scientific quality and not policy relevance in their research."

The echoes of such shifts were increasingly being heard within the country. At the World

Population Conference in Bucharest in 1974, the Minister of Health and Family Planning raised the slogan that "development is the best contraceptive".

The Fifth Plan codified the changed perspective. "The primary objective is to provide minimum public health facilities integrated with family planning and nutrition for vulnerable groups children, pregnant women and lactating mothers. It will be necessary to consolidate past gains in the various fields of health such as communicable diseases, medical education and provision of infrastructure." An "integrated package" of health, family planning and nutrition was included in the Minimum Needs Programme that embraced rural water supply, rural roads, rural electrification and elementary education. (54) The allocation to family planning continued to mount; it obtained Rs 516 crores; health obtained Rs 796 crores, representing o.96 and 1.49 per cent of the budget outlay. (55)

The Emergency, proclaimed in 1975, facilitated the passage of the National Population Policy of 1976. The Policy (56) document acknowledged that "our real enemy is poverty", but that "nonetheless it is clear that simply to wait for education and economic development to bring about a drop in fertility is not a practical solution. The time factor is so pressing and the population growth (sic) so formidable, that we have to get out of the vicious circle (sic) through a direct assault upon this problem as a national commitment." The Policy announced contained a comprehensive range of measures. Centre-State relations were tilted in a distinctly anti-natalist direction by freezing representation in legislature and allocation of federal revenue to states on the basis of the 1971 population figures. Further, eight per cent of Central aid to states was geared directly to their performance in family planning. Monetary incentives were increased and "group incentives" at the level of the village and district were offered. A new multi-media motivational strategy, directed specially to rural areas, was envisaged. Special measures were proposed to raise female education and organise child nutrition in an attempt to stimulate demand for family planning.(57)

In addition, citing no evidence, the policy statement asserted that "public opinion is now ready to accept much more stringent measures for family planning than before". It ruled out nationwide compulsory sterilization, "at least for the time being" only because the medical and administrative infrastructure was inadequate for this purpose. However, state governments were permitted to do so, if they felt that "the time is ripe". State governments were also permitted to introduce rules making employee benefits conditional on sterilization after two children. Employees of the Union Government, it stated "will be expected to adopt the small family norm and necessary changes will be made in their service/conduct rules to ensure this."

Family planning was included in the Twenty Point programme of the Prime Minister and the Five Point Programme of her son, Mr.Sanjay Gandhi. (58) In other words, political backing at the highest level was forthcoming for the adoption of a policy which implicitly advocated compulsory sterilization and the use of administrative machinery to achieve what had so far

been thought of as "unthinkable". (59) (The illusory Myrdalian "soft state" exhibited proverbially lacking "political will" in this instance, as in others, when it could be shockingly hard.)

Targets for sterilization were set at the district level where the Collector was changed with pursuing the new family planning goals. It was not long before the law and order machinery was also involved in "generating acceptance".

The initial results were a high level of recorded number of sterilizations, the original target of four million sterilizations for 1976/77 was ostensibly reached by September 1976, though the numbers reported and their demographic impact are, to say the least, open to doubt. (60) But resistance soon surfaced; there were confrontations resulting in police firings and even deaths. Towards the end to 1976, there was a major episode in Muzaffarnagar in U.P.; the foreigh press estimated between 50 and 150 deaths. The Prime Minister in a statement in Parliament admitted that there had been "some" deaths, but claimed also that "some people" who had nothing to do with family planning had been killed by violent groups.(61)

The States, for their part, vied with each other to implement the targets set for sterilization. Some states achieved 100 per cent for the first time; others, more enthusiastic, achieved 400 per cent. Maharashtra passed a Family Welfare Bill that awaited ratification; the Bill made sterilization compulsory after three children. (The Maharashtra Health Minister is reported to have said, "We have tried every trick in the book and now we have come to the last chapter", i.e.compulsory sterilization. Cited in Ravi Gulati, Op. cit.) A small number of other states followed with alacrity but awaited the outcome in Maharashtra.

But the elections of 1977 intervened and partly due to the excesses committed in the implementation of the family planning programme, the government was swept out of power. (62)

The new government also recognised the need for checking the growth of population. It committed itself to pursuing a family planning programme on a wholly voluntary basis and as an integral part of a "comprehensive policy" covering education, health, maternity and child health care (sic) and nutrition. (63) To highlight the shift in focus, the programme and the executive department concerned were rechristened the family welfare programme and department respectively. The word "target" was replaced buy the phrase"expectation of achievement".

The population statement also proposed raising the minimum age at marriage; the Child Marriage Restraint Act was amended to raise the minimum age at Marriage from 15 to 18 for women, and from 18 to 21 for men. In view of the sharp fall in family planning programme performance, the government announced "an entirely new" scheme for the strengthening of health care services. The Community Health Volunteers Scheme, inaugurated in 1977 as a

step towards reposting "people's health in people's hands" was also visualised as a scheme for tackling the issue of population control "on a war footing".

The Draft Five Year Plan 1978-83 noted that "the climate of coercion and pressure as was witnessed in some parts of the country during the period of internal emergency in connection with the implementation of the Family Welfare Programme resulted in an attitude of antipathy and indifference towards this programme in the post emergency period", and committed itself to continue giving a high priority to the family welfare programme.(65)

The working Group on Population Policy in its Report averred that population policy and the general development strategy are two sides of the same coin, and viewed the problem in terms of creating the necessary level of demand and maintaining supply of services. The Group recommended the achievement of NRRI by the year 2001 and towards this end emphasised female education and health care. The Group further recommended that since "women are the best votaries of the family welfare programme", the programme" for the immediate future be increasingly centred around women".(66)

Basing itself on the recommendations of the Working Group, the Sixth Plan notes (67): "It is almost axiomatic that economic development can in the long run bring about a fall in fertility rates. However, developing countries with large populations cannot afford to wait for development to bring about a change in the attitude of couples to limit the size of their families as the process of development itself is stifled by population growth. Limiting the growth of population is therefore one of the main objectives of the Sixth Plan."

The allocation to family planning was again increased to Rs. 1010 crores; health obtained Rs. 1821 crores, representing 1.03 and 1,86 per cent of the total outlay. In other words, in view of the failure of the strategies hitherto adopted, the quest was on for ways to resurrect the programme. The centrality of population control was reaffirmed, with women now occupying centre stage.

The plant set out short term and long term demographic objectives, spelt out the programme strategy and components and set targets under each. The strengthening of rural health services was undertaken under the Minimum Needs Programme: the share of MNP in the health budget rose from 17 per cent in the Fifth Plan to 31 per cent in the Sixth. Let us note, however, that this effort at creating health infrastructure was at the cost of preventive programmes: the reduction in medical infrastructure was only four percent, whereas that for the control of communicable diseases was 11 percent. (68)

The Seventh Plan document (69), reviewing the progress of the family planning programme in the Sixth, observed that achievement fell short of the targets with respect to all components. This is attributed to, among other factors, lack of infrastructure facilities, the high

infant mortality and the high levels of maternal and child mortality. In addition to recommending strengthening of the health infrastructure and the implementation of the family planning programme, the Plan emphasises the need to pay greater attention to MCH activities to enhance child survival.

The allocation to family planning again increased, to be almost on par with that for health; family planning and health obtained Rs. 3256 and Rs. 3392 crores, representing 1.80 and 1.88 per cent of the budget respectively.

The National Population Policy of 1986 (70) asserted that family planning "is one of the essential components of the national strategy of growth which places equal emphasis on accelerated development and recognise the fact that the process of development is apt to be lopsided unless socioeconomic imbalances among the people, including imbalances in their health services, are removed speedily. It looks at birth control not as an end in itself but as a vital means to the attainment of the goal of 'Health for All' in the shortest possible time.

The rhetoric of policy notwithstanding, the programme was pursued with renewed vigour now aimed at women, concentrating on laprascopic sterilization. The entire bureaucratic chain from the Centre to the village level was activated to obtain cases for sterilization. Achievement of targets in family planning became an important index in the assessment of bureaucrats. The Government of Maharashtra rewards the "best achievers" among Collectors and Commissioners with rest and recreation in Bangkok. (71) Attainment of sterilization targets is the primary preoccupation of the health system to the detriment of all other health activities.

Questionable trials of injectible contraceptives have commenced. Absurdly, but not surprisingly, a leading health expert has argued that in view of the poor health and nutritional status of women in India, the undesirable side effects of these drugs may precisely be the reasons for including these contraceptives in our programme. Thus poor women in our country are offered as guinea pigs to multinationals in their quest for the ideal contraceptive.

A recent report (72) cites the case of a surgeon who has performed 2,50,136 laparascopic sterilisations in camps in less than ten years, noting that "the women were numbered by small stickers on their foreheads and then arranged in two long lines on the verandah of the school leading to the operation table facilitating speedy surgery. A pelvic examination is not considered necessary."

Thus the family planning programme adds to the morbidity load of the poor female population of the country, victims of whatever family planning technology is currently fashionable, even if dangerous.

The Government of India has come to, belatedly, acknowledge that programme has come to a dead end. The Public Accounts Committee in its 139th Report noted that despite massive financial inputs into the programme, the birth rate has remained stationary around 33 per thousand since 1977 (73). Indeed former Prime Minister, Mr. Rajiv Gandhi, observed (74) that there was "inadequate causal connection between our family planning programmes and the impact of these on our birth rates." Not only is there no correlation between couple protection rates and birth rates, there is also no correlation between couple protection rates and growth rates. Gujarat, for example, with a high couple protection rate has a decennial growth rate higher than West Bengal which hand a low couple protection rate.

The Prime Minister called for overhauling the programme to make it more effective. The overhauling is certainly necessary. But administrative reforms and restructuring merely touch the fringes of the problem. The unwillingness to deal with the social- structural determinants of the question necessarily entails waiting for further technical breakthroughs. We remain, meanwhile, as dependent as even on technical solution to social problems not amenable to such solutions.

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ESSENTIAL DRUGS

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The World Health Organization (W.H.O.) has categorised "Essential Drugs" as those drugs that satisfy the health care needs of the majority of the population. The W.H.O. also emphasises that the choice of such drugs depends on many factors such as the pattern of prevalent diseases, the treatment facilities, the training and experience of the available personnel, the financial resources and genetic, demographic and environmental factors.

The World Health Organisation has prepared a model list of Essential Drugs containing about 260 drugs which include drugs for primary care, specialist and superspecialist care, diagnostic agents etc., and it is claimed that only with these 260 drugs it is possible to treat 95% of the diseases of the world. The world Health Organisation has advised its member countries, particularly the developing countries to prepare their own "Essential Drug" list on the basis of the W.H.O. list and on the basis of their health care needs. The W.H.O. thinks that because of the great differences between countries, the preparation of a drug list of uniform general applicability and acceptability is not feasible or possible, Therefore, each country has the direct responsibility of evaluating and adopting a list of essential drugs according to its own policy in the field of health".

A brief analysis of the mortality and morbidity pattern of our country will reveal the actual health care needs of drug needs of our country. According to reports it is estimated that the number of patients suffering from tuberculosis is about 10 million of which 5 lakhs die each year. Of the total 12 million leprosy patients all over the world, 4 million live in India. About 14 million people suffer from filarial diseases and 40 million from goitre. Apart from this 15 million children under the age of 5 year die every year due to diahorreal diseases. There are about 9 million blind persons in India of which about 2 million suffer from Vitamin A deficiency. About half the total population live below the poverty line and more than 60% are illiterate. Only 31% of the rural population has access to safe drinking water and 0.5% enjoy basic sanitation.

It is apparent therefore, that the high incidence of diahoral diseases and other preventable and infectious diseases are specially amongst infants and children. Lack of safe drinking water, poor environmental sanitation, poverty and ignorance are among the major contributory causes of the high incidence of disease and mortality. Needless to mention that drugs alone are not sufficient to reach the goal of Health for All by the year 2000 AD. Removal of contributory causes are necessary to achieve the desired goal. Nevertheless, the organised procurement and use of essential drugs has many advantages in terms of economy and effectiveness in delivering health care services.

DRUG SITUATION

There has been an enormous increase in Drug production since independence in our country. From a mere packaging industry in 1947 manufacturing drugs worth Rs. 10.00 crores or so, it has become a very big industry producing drugs worth about Rs. 2,450 crores of rupees. There are about 60,000 formulations and chemicals in the Indian Drug market. The pattern of drug production shows that only 20 to 25% of the drugs produced and marketed are essential. The rest are profit oriented. Tonics, vitamins, marginal or doubtful remedies, useless or harmful drugs and some others have been banned in the country of origin and in developed countries.

The fact which cannot be denied is that the expansion of the drug industry and increase in the production of drugs do not match the disease pattern of the country or the actual drug needs of the country. On the contrary, the increase is for the business interests of the Drug Industry only. It is also seen that over 70% of the total sales turn over of the drugs in the country is controlled by the Multinational Drug firms. Actually, the present state of health care services in our country together with the expensive network of sales promotion devices of the Multinational drug firms has not only indoctrinated a section of medical profession, but also a sizable section of the people who ask for more and more drugs.

The World Health Organization also expressed concern at the proliferation of non-essential drugs at the expense of life saving and essential drugs. The W H O has observed, "Resources are often wasted in purchasing expensive drugs that are only useful or irrelevant to the solution of the country's health needs; while large segments of the population are in urgent need of essential drugs for disease control and primary health care".

In India, also, efforts were made to prepare an essential drugs list. The Hathi Committee (1975) prepared a list of 117 essential drugs list. The Steering committee of the National Pharmaceutical Development Council proposed a priority list of 95 drugs. Drug policy (1978) prepared a list of 37 bulk drugs grouped in category I and Category II formulations which are highly essential and life saving. But unfortunately no serious attempt has been made to prepare a graded list of essential drugs" to be available to various levels of health personnel and institutions.

The World Health Organisation has laid down certain criteria for the selection of Essential Drugs:

1. While preparing the list of Essential drugs priority is to be given to achieve the widest possible coverage of the population with drugs of proven efficacy and safety in order to meet the needs for the prevention and treatment of the most prevalent diseases.

2. Only those drugs for which adequate scientific data are available from controlled studies shall be selected.

3. Each essential drug must be available in a form in which adequate quality including bio-availability can be assured.

4. In the great majority of cases, essential drugs should be formulated as single ingredient components.

5. The International non-proprietory (Generic) names for drugs should be used when possible.

6. Cost: In cost comparision between drugs, the cost of total treatment and not the unit cost must be considered.

7. The essential drugs should be reviewed periodically at least once a year.

We have prepared a graded list of essential drugs to be used by health personnel and institutions at different levels. We think that these drugs should be made available to all health centers uniformly throughout the year, and we welcome opinion and suggestions from individuals and organisations regarding further updating of the list.

A. MODEL LIST OF DRUGS: FOR A TRAINED HEALTH WORKER

1. Paracetamol tablet
2. Magnesium hydroxide/Aluminum hydroxide tablets (Antacid)
3. Anti spasmodic tablet (Single ingredient).
4. Chloroquine phosphate tablet
5. Metachlopromide tablet
6. Oral rehydration salt
7. Metronidazole tablet
8. Tet-taxoid injection
9. Ergometrine injection
10. Mebendazole tablet
11. Ferrous sulphate tablet
12. Chloropheneramine (anthistaminic) table
13. Folic Acid tablet
14. Theophylline tablet
15. Vitamin A tablet
16. Vitamin B complex tablet
17. Tetracycline eye ointment/chloramphenicol applicaps
18. Antiseptic powder for tropical application
19. Mercurochrome/aciflerine lotion
20. Gentian violet lotion
21. Chlorhexidine solution
22. Benzoicacid/and Salicylic acid ointment
23. Benzyl benezoate lotion
24. Halogen tablet.

B. MODEL LIST OF DRUGSFOR PRIMARY AND SUBSIDIARY HEALTH CENTRES (OUT-PATIENTS DEPARTMENT

(In addition to Drugs in Group A)

25. Adrenaline injection (1 in 1000)
26. Atropine sulphate injection
27. Dihydrallezine and Resorpine tablet in combination
28. Hydrochlorthinazide tablet
29. Ligno-Caine hydrochloride injection
30. Ibuprofen tablet
31. Phenobarbitone tablet
32. Diethyl carbomazine citrate tablet
33. Benzathene Penicillin injection
34. Cotrimoxazole tablets/suspension
35. Senna glycoside tablet
36. Salbutamol tablet

NB: Anti the burcular drugs, Antileprosy drugs, and Vitamin A injection to be prescribed from special clinics and may be supplied to PHC's and SHC's.

Prophylactic vaccines from National Immunisation programme - not included.

C. PRIMARY AND SUBSIDIARY HEALTH CENTRE (INDOOR)

(In addition to drugs in Group 'A' and 'B')

37. Oxytoin injection
38. Normal saline and dextrose saline solution for injection
39. Benzyl penclin injunction
40. Pethadine hydrochloride/morphine sulphate injection or pentazocine injection
41. Prednisolane tablet
42. Dexamethasone injection
43. Diazepam I/v injection
44. Chloramphenicol capsules/oral suspension
45. Aminophylline I/v injunction and Theophylline I/M injection.
46. Anasthetic ether
47. Frusemide tablets/injection
48. Antivenom serum injection
49. Metoclopramide injection
50. Oxygen inhalation.

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PEOPLES' SCIENCE MOVEMENT AND OCCUPATIONAL HEALTH

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As far as this article on Occupational health is concerned the reference to "People' is to industrial workers and that, too, in the organised sector. The case studies presented in this paper are that of Gujarat state.

In the post independence period a number of industries were established in Gujarat particularly after large quantities of natural gas and oil were found at Ankleswar, Kal Cl, Khambhat, Mehsana and other areas. A number of petroleum based chemical industries were established. Apart from this recent rapid development, Gujarat is one of the biggest centers of Textile production.

State of occupational health of workers is very disappointing, the lack of a progressive state and weak enforcement instruments are two main reasons apart from the labour surplus and profit motivation. The lack of pressure from unions can also be one of the reasons.

A number of small and medium scale chemical industries have flourished in the last two decades. The private sector industries offer the worst work places to the workers. In chemical units workers handle poisonous and hazardous substances like aniline dyes or vinyl chloride causing cancer without knowing the health hazards these dangerous substances pose. Unsafe working conditions have to be accepted for existence. The results are clear. They suffer from a number of health problems.

For social and historical reasons strong unions do not exist in general. At the same time the truth is that for many reasons unions have not been able to make this a priority issue. As far as occupational health is concerned, the existing laws are not fully utilised yet. The recognition of occupational diseases, prevention, compensation and rehabilitation are untouched areas, But we do not agree with a myth like "workers are not interested in safety". In support, the only example given is the nonuse of personal protective equipment like goggles, shoes or gloves. unfortunately, it is not understood that protective equipment is not the basic issue for it cannot be an alternative to safe working conditions. Thus the non-utilisation of protective equipment cannot be considered as lack of interest in safety.

People do have an interest in safety i.e. having safe conditions and a healthy work atmosphere. We represent three case studied in brief to support this view.

Alembic Glass Industries is a well known glass industry employing about 1500 workers. It's crockery brand named 'Yera' is popular throughout India. This industry was established as far back as 1944. in size to form fine powder. During this proess very fine dust particles .Glass is manufactured from silica quartz. Silica stones from mines are reduced are generated while crushing. This dust causes a lung disease called silicosis. Around 200 workers work in this department. No body knows how many workers have died due to silicosis till 1980 at Alembic. But we know for certain that more than 100 workers have died due to this deadly disease after 1981 and quite a few are just waiting for their turn.

Workers came to know about silicosis only in 1981 and they immediately rose up. Till then they were treated as T.B. patients and deaths were labeled due to TB. After the workers knew about silicosis they persuaded ESIS for a medical checkup. When they did not succeed they pressurised the Health Minister of Gujarat and through him approached The National Institute of Occupational Health. They were medically checked up by NIOH experts and found that about 115 workers were suffering from silicosis. They were then able to get compensation for silicosis. This was the result of two years of intensive efforts by workers at various levels. This has ultimately resulted in motivating the management to use safer technology. ESIS was very tough and tried to create hurdless at every step. Some cases are still pending with the court.

Tata Chemicals was started 50 years ago to manufacture soda ash, bromine and other products from marine water in Gujarat. It employs about 5000 workers. As usual, workers are given unhealthy working environment. The union says, management does not have an interest in safety. But the workers have taken a good deal of interest. They have raised their voice to get safer working conditions. One of the workers wrote a letter to the Chief Justice of Gujarat High Court. This letter was accepted as a writ petition. A notice was issued to the company. Goons hijacked the worker, who was then taken to a small town where he was forced to sign some papers and then was taken to the High Court. He knew that he had signed an "affidavit" declaring that whatever he had written in the letter was false and that he intended to withdraw his complaint. The Court did not accept this affidavit and ordered NIOH to enquire into the report. Accordingly a summary enquiry was carried out. At every step the union and workers have challenged management and have exposed the attitudes of the management towards safety, and have tried to establish their right for safe working conditions.

Ahmedabad Electricity Company generates electricity from thermal power, i;e. it uses coal to produce electricity. Between 1970 to 1980, 13 workers died of different diseases like heart attacks, cancer etc. These workers were from the Boiler Maintenance Department. Workers were convinced that the main causative factor behind the deaths were the working condition. They came to know of the NIOH. One of the workers took an oath to work for bringing changes in the working conditions. They first submitted a memorandum to the Company with copies to the Labour Commission, Labour Minister and Health Minister.

Nobody reacted. Mr. Raghunath declared that he would start an indefinite hunger strike. This produced results. It was decided that NIOH would undertake medical check ups as well as a workplace survey. This took three years. The reports were submitted but the management was not prepared to implement the recommendations. Raghunath wrote a letter to the Chief Justice of the High Court of Gujarat. The High Court issued the notice to the labour department. There was a surprise check by the Labour department in February 1984 but this did not bring any results. Even this was done after four years of untiring efforts. Again the Courts, again meetings, negotiations and an agreement was arrived at. In March 1985, a programme was decided upon and agreed to by both the parties. Efforts through the unions were really not that fruitful. Hence, workers changed their strategy. Raghunath started taking an interest in quality circles. According to the workers, this has brought in some results, particularly some changes in attitudes. Their efforts have not ceased. The workers have continued to oppose the unhealthy working conditions wherever they notice them.

We in Baroda have formed the Vyavasayik Swasthya Suraksha Mandal to support the workers movement for better working conditions. We provide information about health hazards to workers and trade unions. We publish a bi-monthly bulletin in Gujarat and organise exhibitions and film shows., We forward complaints received from workers to the concerned authority and liaise with the Inspectorate of Factories, Journalists and medical practitioners.

In the course of our work, we have found dust related diseases a serious problem in Gujarat. Byssionosis is a disease caused by cotton dust. As per a recent study about 30% of the workers exposed to cotton dust are suffering form Byssionosis. Ahmedabad is a leading centre of the cotton industry. Thousands of workers in Ahmedabad are suffering from Byssionosis.

In Godhra at least 700 workers have died in silica mines. In Khambhat thousands of workers including housewives and children working in the agate industry are suffering from silicosis, hundreds have already died. Every house has its own story. There are at least five glass industries. The Alembic experience has already been narrated. In Surendranagar dozens of workers are suffering from silicosis, some have died. In various parts of Gujarat, the Ceramic industry is booming. The danger of silicosis is also real for ceramic workers.

All these instances have compelled us to think seriously about dust related diseases. We intend to start a campaign to identify such areas and affected workers, help them getting compensation treatment, rehabilitation and to prevent disease for workers not yet affected.

Official data about workers suffering from these diseases is almost absent and we will have to do something about it. The Medical practitioners, particularly those responsible for treating these patients will have to be motivated to concentrate on this issue. So far this is the

botheration of only the Labour Ministry, But we will have to ask the Health Ministry to take up some programme for those sections of the community, just as they are running programme for malaria, TB or leprosy. Experiments with the alternative treatment will have to be attempted, like homeopathic treatment for silicosis Manufacturing process should be reviewed and changes should be recommended for better working conditions as preventive measures, Lawyers will have to tackle the issue of compensation. Problems of dust related diseases is not only in Gujarat but there are textile mills in Bombay and elsewhere, asbestos mines in Andhra Pradesh, Mica mines and coal mines in Bihar, marble mines in Rajasthan, slate pencil industry in Mandsaur, in MP and many more areas where workers might be suffering from these diseases. We invite activists of the Peoples Science Movements to contribute in this campaign and be in touch with us.

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PEOPLES' PARTICIPATION IN HEALTH: THE CATALYTIC ROLE OF THE KERALA SASTRA SAHITYA PARISHAT (K S S P)

V. Raman Kutty

INTRODUCTION: Community participation has been accepted as a major factor in health development strategies in the context of health for all by 2000 A.D.' This marks a departure from earlier paradigms where health was seen as a purely 'techno economic' problem: technology being inappropriate and/or unavailable, and if available, resources being constrained so as to make access impossible for most of the population. This rethinking has come in the wake of the WHO's adoption of the policy of primary health care as the appropriate one for reaching health for all, when it was realised that health development in most of the third world followed inappropriate models.

But community participation cannot be understood in isolation from the realities of the social situation. If the power structure of the society and the resource misallocation that it has given rise to is ignored in promoting community participation, then it is likely to degenerate into a passive participation as 'beneficiaries', and not participation in decision making [2]. This would only serve, in the name of community participation, to legitimise exploitation in the health field.

Non-governmental organisations (NGO'S) are seen as nodal agencies to promote participation by people in health activities. This is because in most developing countries, government institutions are apathetic to the real needs of development in the rural sector. Moreover, NGO's also seem to inspire more confidence in the people than government organisations which are often viewed with suspicion due to various reasons. (Here NGO is used in the sense of any organisation other than profit making commercial concerns, not connected with the government).

Most NGO's active in the health field share some common assumptions. Important among these is that 'under development' is caused by inadequate institutions and poor public policy, and the powerlessness of the governed. Of these organisations, one can recognize two types" research and analysis oriented, and action oriented.

But it is also true that many NGO's do not offer a viable alternative in development. 'Lip service is often paid to such phrases as 'Community based' and 'Community participation'. Many projects are seen as offering neither responsibility nor opportunity for decision making locally. In many instances, decisions are taken at the national level by the elite. Often foreign managers and their salaries absorb a large percentage of the available funds [3]. At best these types of NGOs offer a bland voluntarism which smacks of charity; at worst they degenerate

into agencies subtly serving the interests of foreign organisations or governments in the country.

It is in this context that we propose the unique role and experience of the Kerala Sastra Sahitya Parishat (KSSP) as a model for development efforts from the people in the area of health.

HISTORICAL BACKGROUND: The KSSP was formed in 1962 as an organisation of science writers in Malayalam. It evolved from earlier societies in the fifties primarily concerned with the problems of those who were trying to popularise science in the local language. Very soon it grew into an association which welcomed anyone interested in science and prepared to accept the scientific method as a guideline to analyse problems of man, life and society. This growth also meant that the organization changed its style from detached deliberations of intellectuals to active action-oriented programmes and involvement at grassroots level. It was sustained by a very democratic style of functioning and grew to have numerous branches throughout the State.

The Parishat has a guiding philosophy which can be summed up as 'Science for social revolution'[4]. In other words the scientific method forces us to see (a) all processes as constantly subject to flux or change, and (B) the potential of science as an agent to bring about change in a desired direction, i.e., towards a more equitable distribution of opportunities in society. Unfortunately, we see that the potential of science is used very often to extend and intensify exploitation in society.

Thus the KSSP has been in the forefront of all major movements in the state towards a more people-oriented policy in areas such as energy, health, environment, and planning. Notable among these are its involvement in studies on the ecosystem of Kuttanad, on the industrial units in the state, pollution caused by various industrial units in the state and its championing of the cause of preserving the silent valley, a veritable gene pool against submersion by a proposed hydroelectric project. This latter struggle earned to KSSP many epithets, from friends and enemies alike, notably that of being 'anti-development'. But in the decade since the project was abandoned, most people have accepted the wisdom of the KSSP in opposing the silent valley project.

The KSSP sees its involvement in health as part of this overall scheme. Its major thrust area in health has been, for a long time. the need for a rational drug policy. Kerala is a state where the demand for health care is being exploited to the fullest extent by national and international lobbies alike. It offers one of the major markets in India where considerable amounts of irrational and even dangerous drugs are being sold. This is the result of an unholy alliance between profiteering firms and some not very discerning doctors. The Parishat launched its campaign for a rational drug policy with seminars, discussions and meetings all

over the state, taking the drug issue right to the people. A major initiative was the seminar 'A decade after Hathi committee' in 1985 in Trivandrum. It can be said that the KSSP was responsible for the revival of the Hathi Committee report from the quite oblivion to which it seemed to be delegated by the authorities.

Health activities initiated by the KSSP took many forms. Some of these, over the years. have been:

1. Organising of thousands of health classes for the people in 1985,

2. formation of hospital protection samitis

3. Publication of the book on Banned, Bannable and Essential Drugs.

4. drug information packet for the doctors.

5. the health survey in 1987, which was an occasion for educating Parishat activists on the public health issues in the state,

6. the call for boycott of Union carbide products following the Bhopal industrial disorder, and the campaign against the callousness of MNC's operating in underdeveloped countries,

7. most recently, the initiative to utilize the 100% literacy drive in Ernakulam district to make a campaign for 100% immunisation in the district.

The Parishat shares with other health movements in India a strong critique of the existing health system, which is characterized by hospital and curative orientation, urban bias, and elitism. But it does not subscribe to the view that it is futile to attempt to reform it. The KSSP has stated its desire to see a dialogue between scientific practitioners of different systems so that points of convergence may emerge. But the KSSP does not support the view that modern medicine is an alien science and should be rejected in toto.

The theoretical frame work for the KSSP's health activities can be summed up as follows:

1. Health of the people cannot be seen in isolation from the socio-economic process around us. It cannot be reduced to an equation of doctors, drugs and technology.

2. The increasing technological complexity of modern medicine has led to an alienation of health care from the people for whom it is intended. This in turn results in exploitation of the people by unscrupulous professionals, companies, and others in the health field. knowledge is the best guard against such exploitation. So the KSSP aims to arm the people with information.

3. Ultimately, 'health for all' cannot be achieved without active support form the people not only as beneficiaries but also in the decision making process. So the KSSP tries to act as a catalyst in inducing people's participation in health.

The greatest advantage of the organisation over its fellows groups active in the health field is that it is not confined to health activities alone. Thus the KSSP worker is aware of the links between the campaigns for cleaner water, better stoves, and the drive for promotion of oral rehydration. He sees the organisation push the campaign for 100% literacy to one for 100% immunisation, and how literacy helps create the demand for immunisation. This is a unique role which very few other organisations are fortunate to emulate.

Moreover, health activism in KSSP is not confined to doctors or health professionals. The 'demystification' of health is an important part of our strategy to take health to the people. The grassroots level accptance and democratic functioning of the organization provide a better environment for promoting health action.

SOME CONSTRAINTS: Being a mass organisation KSSP has its own problems. Most voluntary organisations in India play a complementary or substitute role. Because Government organisations are inadequate to perform their own tasks in health, voluntary agencies try to replace them or substitute their work in some areas. They do most of the jobs which ought to have been undertaken by the government agencies themselves. The Parishat does not believe in this philosophy. We think that in a democratic polity, popular pressure can and should result in a more responsive role by government institutions. This often means that some avenues of activity are restored to only as a last measure. The KSSP is also particular not to be involved in major projects involving donor funding. This is a reflection of our philosophy that resource constraints are not the major reason for underdevelopment.

Being an organisation of people who give their time and effort voluntarily, we have sometimes had difficulty in maintaining a disciplined time schedule. This is something where every effort is being made to improve.

Even though the KSSP is an organisation committed to the ethos of science it has had very little opportunity so far to initiate original research. This has been compensated to a large extent by the involvement in action research as in the development of smokeless chulhas or the health survey. The Integrated Rural Technology Centre is a specific step in this direction to initiate research appropriate to the needs of the people.

In conclusion, the KSSP in health strives to act as a catalyst for people's participation. Without this, we believe, no programme in primary health care shall ever be successful.

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A "PEOPLES' CLINIC" - EXPERIENCES

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"RAMACHANDRA REDDY PEOPLES POLYCLINIC" as it is now called is an institution which serves the people of Nellore District and its adjacent districts in its own humble way. It is managed by a trust. It may be interesting for an activist in the health movement, to know of the experiences of a hospital whose basic concern is common man and his ailments.

BACKGROUND & DEVELOPMENT OF THE PEOPLES CLINIC

Dr. Ramachandra Reddy's activities and the evolution of the Peoples Clinic cannot be seen or understood separately. They are so closely interrelated that a brief account of his activities is necessary to understand the guiding philosophy behind the people's clinic.

Inspired by the National movement in the thirties when the country was politically electrified, Dr. Ram, as he is fondly called, was drawn into the struggle against the British. Coming from a very remote village of Nellore District, he was able to see, experience, appreciate and understand the suffering of the vast masses from the rural areas. These people got very little food to eat and practically no clothing on them, emaciated to the bones, no worthwhile shelter, literacy unknown children utterly malnourished, production primitive, superstitions rampant, almost bordering on tribal culture. Added to this were the attrocities of the landed gentry, the religious clergy and harassment by the police. He wanted to fight against these injustices and do something to alleviate the sufferings of the atrociously bad living conditions of the poor. He was naturally driven to the the National movement from his student days. He drew inspiration from his elder brother, the late Com. P. Sundarayya.

With this background he, having become a doctor, wanted to utilise his knowledge and technical skills in the service of the downtrodden not only in the field of medicine but also in the social, economic, educational, cultural and political fields. His area of work also extended to organising intellectuals. He established Science Clubs, drew intellectuals (College teachers, doctors, lawyers etc) into them, and was able to inculcate scientific attitudes through their activities.

His status grew, and enabled him to play a key role in averting communal clashes in Nellore town. He became a legend in his own lifetime.,

The influence of his activities moulded the thinking and working pattern of the doctors and staff of the hospital. He captured the imagination of the youth and mobilised them in the service of the down trodden. The peoples Clinic slowly emerged and evolved into an institution and with a philosophy of its own.

BEGINNING:

The Hospital was started with a team of three doctors. of course, Dr. Ram's name is synonymous with the clinic. He brought modern medicine in a revolutionary way within the reach of the poor people. He and his team of doctors did a lot of primitive, preventive and curative work, on a very large scale. He himself being an eminent, skilled and exceptionally sharp doctor was able to train many doctors to become proficient in their skills. He adapted the western oriented modern medicine to the relevance of a poor backward country. He trained his own paramedical staff in a fitting way. He trained thousands of youth (primary school teachers, transport and other workers, farmer) as basic first- aiders.

Taking note of the strong family traditions in rural India, he utilised the services of the family members in attending the sick, instead of the hospital-aides. He involved a new concept of a family member attending on a patient more or less as medical- aids, with good results. In the course of treatment, he was able to communicate with the family members of the sick people about health, hygiene and pestilence etc. During this process he was able to convince the people and dispel many a superstition among them. At the same time, he would demystify the therapeutic wonders of modern medicine. At times when communicable diseases (cholera, malaria, filaria, small pox, measles, chicken pox etc.) become epidemics he used to go to the villages and take the people into confidence and saw to prevention in the first place and treated those who were affected. In a very short time he was able to achieve spectacular results in all these epidemical forms of diseases.

Another important area of his mass education was nutrition. When people had a mis placed understanding concerning food habits ("bread, apple, barley etc. are better food for sick people") he offered a proper perspective in a relevant situation.

Even though other doctors and staff members of the hospital worked in the same direction as that of Dr. Ram's the hospital personified him. We are zealously guarding the traditions set by Dr. Ram.

As the Hospital grew into an institution, more and more people joined it and today it is a fully grown polyclinic sheltering many departments of modern medicine, with all necessary diagnostic and therapeutic paraphernalia for both treating patients and training doctors. And finally it is being recognised for training postgraduates in general medicine, general surgery and gynaecology and obstetrics.

The doctors, 120 of them, trained in the above said traditions are spread out all over Andhra Pradesh. They have been able to reach out the most needy and neglected sections of the society.

CURRENT ACTIVITIES:-

Apart from the curative area of health, the institution is engaged in many other activities, in the path shown by Dr. Ram.

In the recent past, youth drawn from rural Nellore were trained both in health education and limited first-aid. These paramedics guide the people in their respective villages to take necessary preventive steps amongst the community and guide those who need curative treatment appropriately and in time. They also offer relevant information to the health authorities and get various preventive measures implemented in their villages. These health workers have achievements to their credit in the fight against diseases like cholera, malaria etc and the large scale immunisation in rural Nellore.

In the field of health education our doctors used to educate patients and their families about day to day misconceptions and misunderstandings (Tonics, injections, health drinks, food habits etc). Most frequently prescriptions are bounded by the W.H.O list of essential drugs. We scrupulsously avoid unnecessary drugs, hazardous drugs and irrational drugs. This method is evolved through persistent discussion and education of our own team.

The Institution is imparting knowledge and skills to undergraduates over three years in all branches of the medicines such that they could handle any emergency even in rural setup. The doctors are trained in such a way that they can manage medical, surgical and obstetric problems. Such basic doctors, we feel, are needed in the present Indian situation, where specialities are mushrooming and mostly cater to the rich, leaving the majority of the poor to poor medical facilities or be treated by fresh medical graduates, who have undergone premature training in Medical Colleges in dealing with the rural medical problems. The paramedics are also trained in such a way that most of them not only attend to the needs of the ward, O.P.D. operation theatre but acquire basic skills in the techniques of X-Ray, E.C.G. and laboratory tasks.

Through our Health Institution, we have immense opportunities to penetrate into the closed groups of Society, (who have been shielded by various vested interests) and give them some out look on health education and scientific attitudes.

Through exhibitions, cultural programmes, book publications and public meetings, our doctors are inculcating scientific attitudes in common people. We have achieved good results in these fields. We found that people readily accept most of the scientific thinking in the field of health (breast feeding, ORT etc) provided they are properly communicated in a convincing manner.

At times of natural calamities, teams from our institution rushed to affected areas and helped the victims in its own way (Great Bengal Famine of 1943, Rayalaseema Famine of 1952, the tidal wave of Coastal Andhra in 1977 etc).

These, interactions with the people are instrumental in moulding and refining our institutions attitudes and working patterns.

We have to go a long way in the area of preventive health and the institution is gearing up for this task. The curative side is worth mentioning. Daily on an average 350-400 out-patients consult and receive treatment from doctors. The in-patient turnover is 6,000 per year, with a 175 bed capacity. The major surgical procedures performed per year are more than 1,2000 and minor surgeries are of the tune of 5,000 per year. This large turnover of patients in the curative sector is one of the factors responsible for doctors panetrating into the society and reaching out to remote villages. One of the main reasons for this large turnover is also the cost effectiveness of the treatment. The modern medical facilities meet the requirements of the needy at a low cost because of the sacrifice and industry of the doctors and staff, and also because of the ethical methods adopted.

In conclusion, the institution is being recognised as the one for people, and they own it and protect it. But all this is not achieved smoothly. It involves a fight against many odds, conservative outlook and many attitudes. In one sentence it is a swim against the current and continues to be so. The experience is not possible without the services of many dedicated youth, who have come to work here as doctors and paramedics.

The tremendous mass support this activity received from the people, the sacrifices of various individuals and the everlasting inspiration from Dr. Ram are instrumental in building up this institution over the last 50 years.

BEING HEALTHY

(or)

HEALTH FOR ALL - NOW

INTRODUCTION:

The single most important need for all of us is good health. It is more important to us than all the wealth in the world. It is true that all of us must eventually die - but if we are to enjoy our lives and live it to the fullest extent, we must be healthy. Ill health and disease also results in the premature death for crores of people. While in many countries of the world a child born can expect to live an average for 75 years or more, an India child can expect to life for only 57 years. While in many countries of the world for every 1000 children born less than 10 will die in the first more than one in every ten.

Even this figure does not tell the truth for it averages figures over the rich few and the many who are poor. The poor important by such figures hide the fact that while they live the poor suffer from repeated attacks of disease and their growth and development is stunted both physically and mentally and thus they never live a full life.

WHAT IS HEALTH?

"Health is not the mere absence of disease. Health is a state of complete physical, mental and social well-being" (Definition of Health by World Health Organisation). What is it that our being healthy depends on?

Being Healthy depends essentially on our having adequate food to eat, safe water to drink, a clean environment to live in, proper employment and proper leisure. These five components are essential to health.

HUNGER:

It is meaningless to talk of good health when most of us do not have enough to eat. Hunger is the single major cause of ill health, suffering and death in the world today. Twentyfour people, eighteen of them children under the age of five die every minute of hunger - and the root cause of this is their poverty. Hunger causes death directly but more often the people who die of hunger are seen as dying of some disease or the other. A body weakened by hunger is prey to every passing illness. A mild diarrhoeas, an attack of measles, a chest infection, a fever - which in a normal healthy person would last a few days' is enough to kill a malnourished person, especially children. Thus it is that the commonest cause of death of children are conditions like respiratory (Chest) infection, diarrhoeas, measles, all of which need never have caused death at all but for the malnourishment.

Malnourishment also causes stunted physical growth of the child, so that it can never realize its potential. (The average weight of the Indian rural male is low as 44 kg, while of the female is only 40 Kg).

The root causes of malnutrition lie in poverty the inability of people to purchase the food they need. There is, except on occasions, no true scarcity of food. Indeed our country grows enough food - even for export if necessary. And if needed we do have the capacity and knowledge to produce much, much more.

A BALANCED DIET:

Is malnutrition caused by lack of knowledges about the type of food to be eaten? Scientists say that a proper diet - a balanced diet for an average Indian must include adequate staple grain like rice or wheat or Jowar, and adequate pulses. It must include about 170 gms of vegetables, about 65 ml. of fats and oil 55 gms. of sugar and at least 250 ml. of milk or equivalent value of meat, fish or eggs. If a person has all this he needs no special health foods, no tonics to maintain his health. Food is the best tonic.

Grains like rice of jowar or wheat are the main food. They are the chief suppliers of energy for the body. The fats and oils are also a rich source of energy and especially in children they are important, as the stomachs of children are small and they cannot eat too much of just rice or-wheat. Fish, meat, eggs and milk contain much needed protein-the substances from which our body tissue is built. Pulses, groundnuts and grains also contain protein, but this protein is of a poorer quality. However, when different types of such protein are mixed and taken-like for example dal and rice, the body's protein requirement is met among growing children the demand for protein is high.

Other than these the body also needs small amounts of substances called vitamins. Carrots, mangoes, leafy vegetables and fish, meat especially liver are good sources of vitamin-A a substance essential for our eyes and skins. Lack of this is a major cause of blindness in India. Fish, fruits and vegetable are a good source of Vitamin-C, especially lemons guavas, amla. Even green chilles and other fresh vegetables and fruits contain these which a lack of, leads to painful bleeding of the skin and joints.

Milk, eggs, Vitamins and meat provide Vitamin-D. However, a good exposure to sunlight is by itself enough to provide enough Vitamin-D. A deficiency of the substance which is essential for strong bones and teeth is thus commoner among women who stay indoors all the time.

Besides there are minerals, like iron which is needed for the blood calcium that is in turn needed, for the bones and the iodine. These too are obtained from good, and the balanced diet suggested would provide all of it.

However, the average Indian finds such food far out of his reach. His money is just enough to buy the staple grains that he needs and some salt and perhaps a few chilles, and if money permits a bit of dal. An average Indian family of about 5 or 6 people would require almost 3.5 Kg. of rice or jowar or wheat and about a quarter Freon of pulse per day. This itself would cost at least rupees twenty per day and even this is fairly expensive. One has to remember that on many days there is no work to be had, or there is sickness that prevents him/her from earning a wage. It is for these reason basically that the poor do not have a balanced diet. They know that milk is good for children, that eggs are good for health, that green vegetables are good, that meat and fish make you strong - but they cannot afford them.

There is nothing much that a doctor can do as a doctor to remove this single most important cause of ill-health. Were he to prescribe a tonic or a milk powder or health food he is actually depriving the family of much needed food. Such health foods and tonics are frauds promoted by drugs companies to make money out of the misery of people. They use people's ignorance covering the causes of ill health to earn super profits. An egg contains more protein and vitamins per rupee that any tonic or health food on the market. Jaggery, groundnuts, green leafy vegetables, bananas, guavas, oranges and lemons are all healthier and more nutritious than any tonic and far cheaper too.

COMBATING HUNGER:

What indeed can be done to tackle hunger and ensure health good? The single most important measure is to ensure employment that provides a minimum income necessary for a person to live as a human being. This would mean effective formulation and implementation of laws regarding land reform and ensuring a minimum wage for agricultural workers and indeed all other categories of workers. Whatever the circumstances, the minimum wage cannot be less than the amount needed to provide the minimum food, clothing and shelter needed to sustain life and this can be determined by scientific calculations.

Ensuring employment must also in the present context mean rural development programmes and technologies and industrial development strategies that are able to absorb the entire labour force and provide gainful employment to all.

NUTRITION EDUCATION:

However a proper programme of nutritional education may be needed in addition to ensuring a minimum income, especially to help parents make optimum use of the scarce resources available to provide proper nutrition to children. Malunutrition among children is often compounded by wrong feeding practices and the inefficient use of available resources.

Breast feeding during the first nine months of life is one effective guarantee of good health. The change to bottled milk powders and infant formula is a major cause of preventable infant deaths and in most cases should never be done. Even where bottles are to be used close attention needs to be given to washing the bottle and plastic nipple in boiling water for at least 5 minutes or better still feeding the infant with a clean spoon and avoiding the bottle altogether.

Young children also need a higher amount of energy and proteins to increase their body weight. Too often the food given them is inadequate. Again because their stomachs are smaller and can hold less food at a time, it is essential to ensure that their food is particularly nutritious. Thus more milk and eggs, groundnuts, cheap fruits like bananas etc. should be given them as also a greater content of fats and oils.

FOOD SUPPLEMENTATION SCHEMES:

Food subsidises are no long term solution as they are difficult to sustain due to the high costs involved and more importantly since they create a culture of depedency. However, given the abyssemal poverty of some sections of the population and the impact that it has on the food intake of the sections within these sections which are most vulnerable to the ill effects of malunutrition namely children and pregnant women, food supplementation or subsidy schemes remain an essential component of primary health care. It is therefore essential component of primary health care. It is therefore essential that special nutrition programmes, the ICDS 'Anganwadi' based programme and mid-day school meals programme be strengthened and expanded along with schemes like the 'food for work' efficiently, and in a corruption free manner and to ensure that these subsidies reach the sections that need them most.

SAFE DRINKING WATER:

After food, the single most important determinate of health is the availability of safe, potable drinking water. Water is an essential component of all life. Today the efforts to secure adequate water for one's essential needs occupies the energies and time of most households, especially of the women. There are many districts especially in Punjab, Harayana, Andhra and Tamil Nadu where the water so obtained had deleterious levels of fluorides - a substance that leads to crippling of a considerable section of the population. At other places high levels of iron or salt makes the water difficult to drink. Indiscriminate dumping of factory effluents especially from chemical companies and tanneries have also rendered water hazardous for drinking in many areas all over the country, as for example in and around Madras, North Arcot etc.

More commonly water is a carrier of dangerous germs of diseases like diarrhoea cholera, typhoid, poliomyelitis, leaptitis, worms. These germs enter the drinking water source in the firstplace due to the unscientific disposal of faecal matter. The faecal matter from persons suffering from these diseases contaminates and multiplies in water and when such contaminated drinking water is drunk diseases spread. Sanitation, especially the safe disposal of faeces and provision of safe drinking water are therefore two sides of the same coin. Scientists estimate that almost 80% percent of all preventable diseases can be eliminated by the provision of safe drinking water alone. 'The status of health in the country should be measured' not by the number of doctors it has, but by the number of water taps' - a very true quote indeed to which we may add the number of water taps with water in them:

Provision of safe drinking water and proper sanitary facilities is not an insurmountable problem even with already available technology. What would concretely need to be done for this in wells taking all the necessary safety precautions to prevent contamination One may for example, need a) proper construction of ,b) chlorination of wellsin your area, c) filtration plants in urban areas and larger rural habitats with a regular piped water supply, d) prevention of defecation near tanks and streams from which water is used for drinking purposes e) construction of locally appropriates, cheap and culturally acceptable latrines along with a proper sewage disposal system in urban and larger rural habitats, f) defluoridation techniques or identification of safe drinking water sources in fluoride and in affected areas, g) preventing factories and sewage disposal systems from dumping untreated or hazardous waste into river and other water sources including the sea. If indeed this is such an important, yet in most places an easy measure, why has it not been done? There are many reasons, but one major reason that the people have not demanded it - despite the fact that diarrhoea has killed by the thrmoundi and polio has crippled more of our children than any health, and it is high time we organized and ensured safe drinking water in our own areas.

There are however many areas in the country where availability of any water is great problem. In such areas engineering works minor or major, will have to be taken up or new technologies like desalination of salt water, adopted.

ENVIRONMENT

The third important determinant of our health is the environment we live in. By environment we mean the physical environment, the biological environment and the social environment. A healthy physical environment refers to clean land, clean water and clean air. To the millions living in the slums of our cities, this is merely a dream. Air pollution due to both industries and inefficient smoky chulhas are a major cause of chronic cough and other respiratory problems. The indiscriminate use of pesticides and unsafe unscientific disposal of industrial wastes, poisons the land and water in many areas.

BIOLOGICAL ENVIRONMENT:

Man as part of the living world, and related by evolution to all living things., is affected by mishaps in the living world. Cutting down of trees and green plants deprive the air of oxygen so essential for life. The indiscriminate eradication of so many plants and animals has altered the delicate balance in nature on which all life depends. This as well as unplanned urban and rural development that results in dirty cess pools of water in all out cities and towns have become ideal breeding grounds for mosquitoes and flies and other carries of disease. The mosquitoes alone is known to be a vector of five diseases in India malaria, filaria, brainfeaver (Vira encephlitis), viral fevers (dengue), hemorrhagic fevers (Fever with bleeding) the first three of which are major causes of death and diseases. Flies are the carriers of diseases like typohoid, cholera, worms and dysentery and many other diseases. The sand-fly causes kala-azar in many parts of Bengal, Assam, Bihar and Orissa. Similarly pests on crops are also rapidly multiplying. Control of such pests whether affecting man or crops is possible in the

along run only by ensuring a proper ecological balance and a health environment. Measures such as pesticides may be needed in a limited and controlled manner, but seldom will a solution appear on its own (The failure of programmes like the National Malaria Control Programmes are related to this).

SHELTER:

However, by environment we need also toinclude the social environment. The provision of good shelter and clothing is one major aspect. A person with adequate clothing living in a well ventilated house which is not over crowded or is located in an over crowded area is far less likely to be affected by disease than the ,millions of homeless scantily clad people or those who live in crowded, dark, hovels. The major cause of death in our country other than diarrhoeas is respiratory infections and the single main cause of respiratory infection is the type of physical and social environment we live in. It is estimated that 22% of all deaths are the consequence of respiratory infections alone.

Of the various respiratory infections, by far the most serious is tuberculosis. Despite various programmes the incidence of tuberculosis continues to rise and the nnumber of patents suffering from the disease exceed a million today. Despite the fact that good drugs are available 5,00,000 die every year. On the other hand, tuberculosis which was a common disease in the West once is now almost eradicated there. This is not prirarily due to drugs but to less overcrowding, better shelter and nutrition. Even in India, tuberculosis is primarily a disease of the poor and a reflection of their standard of living.

EMPLOYMENT

Another aspect of the social environment and an essential pre-requisite for health is proper employment and leisure. Proper employment is not only essential because of income to purchase food and clothing and shelter, but it is essential as an end in itself for mental and social well being. Indeed man's prime want is to play a productive and useful role in society and his satisfaction is greatest when his employment ensures this. His leisure time could be given to rest and for developing the various aspects of his self that contribute to being a complete human. Indeed, a social environment free of conflicts and tensions, meaningful employment and adequate leisure are the basis for mental and social well- being for a truly healthy citizen. (The basis of many a social disease like suicide, alcoholism, drug addiction and crime are to be found in the lack of satisfactory work and related social tensions). Just as only healthy individuals can make a healthy society it is also true that a healthy society is needed for healthy individuals.

HEALTH EDUCATION :

To nearly all people much of this is common knowledge. Medical science has only helped establish that most diseases result from a lack of these essential requirements. Medical science has helped us understand also how for example diarrhoea results from contaminated water so that not only can we prevent the water from being contaminated but we can treat a

patient affected with diarrhoea. To do this the understanding of how our body works both in health and in disease is essential. Though there is a lot that we do not know still, over the centuries humankind has accumulated a lot of knowledge concerning the disease. Medical science is one of the most ancient sciences of all. This knowledge about how our body works and about how diseases are caused is another essential pre-requisite of being healthy. It is necessary that not only doctors and nurses or health workers know of this but that every person has a minimum idea of what is involved, so that they understand their own bodies and keep it healthy.

Health education should also include a minimum knowledge of diagnosis and treatment of simple diseases. Take for example diarrhoea. If diarrhoea is watery and not associated with blood or mucus the best and only correct treatment is to give the patient plenty of fluids. The fluid advised can be prepared at the home by mixing a scoop of sugar and a pinch of salt in a glass of boiled water. Alternatively rice water with some salt added is also good treatment. The majority of deaths due to diarrhoea, especially in children can be prevented by this one measure alone. Indeed more deaths have been prevented due to this one advance than any other single advance in medical science in these last few decades.

Similarly colds, simple cuts and bruises, an occasional body ache or headache can all be treated with proper knowledge.

Health education should also be adequate for people to identify certain serious diseases like polio, measles, chickenpox, tetanus etc. So that they seek medical help early.

Measures to prevent diseases like tetanus & rabies, knowledge about immunization, knowledge about occupational health hazards-all are essential aspects of being health.

EDUCATION :

Obviously a literate person has far greater access to such knowledge than an illiterate person. Literacy is an essential component of health. But mere literacy is not enough. The level of general education is important. General education increases the 'health literacy' of the people. It enables them to understand their health problems and how to identify, prevent and control them. It helps them make maximum of what is provided to them including nutritional supplements, vaccinations, medical care and essential drugs. Formal schooling lays the ground work, for health knowledge and health behaviors in the most formative period of an individual's life and therefore the health content in schooling must be given special attention. But outside school a wide variety of institutions, programmes and media disseminate a lot of knowledge about health, and the access to this information is directly related to literacy.

Women's literacy and schooling of girls needs special emphasis for the impact of this on society and the family is much more.

Indeed just like food, water, shelter and work, education must be also considered an essential component of being healthy.

MATERNAL HEALTH CARE :

One area where medical science has led to a great benefit is in pregnancy and childbirth. There was a time when many women and even more children died due to pregnancy and during childbirth. Now we can in most cases detect problems of pregnancy well in advance and take proper steps to save the lives of the children, and mother. We know that a pregnant woman needs extra nourishment and should have more rest and should be spread heavy work. We also know that if they have many children too soon and too frequently it endangers the lives of the child and the mother. It is recommended that the first child should be after the age of 21, the second child should be after a gap of 4 years at least and there should be no third child. This is essential to safeguard her health.

Suitably trained persons - both doctors and health workers can detect the pregnancy cases where natural delivery is not possible or dangerous and in such cases the child can be safely delivered by an operation or forceps. When natural delivery takes place we can ensure by simple hygienic measure that any trained nurse knows that the delivery is safe and that there are no complications for the mother.

CHILD CARE:

The newborn child fed on breast milk from a healthy mother is likely to be healthy. Immunization protects against a few major killers like tetanus, diphtheria, whooping cough measles and polio. Proper nutrition and feeding practices are necessary to prevent to and early death. It has been shown all over the world that where primary health care measures are taken less than 10 children die out of every 1000 born within the first year of life and almost no mother dies. However, in countries like ours more than 100 children die, the number being much higher among rural poor women and more than four mothers out of every 1000 die at child birth and many more (About 40/1000) die in this age group due to causes related to childbirth indirectly.

The reason for this lies in the poor health of our mothers and the difficulty in getting, or the total lack of maternal and women are not adequately aware of why they need such help even though such help will make a vast difference to their lives and that of their children's. The children of illiterate women die far more often, than those of literate mothers. Studies have even established relationships between numbers of years of schooling of the mother, and infant mortality.

This is not only related to the proper socio-economic background of the concerned population and the knowledge about health that literacy contributes, but also to a critical awareness of their own reality and their attitude towards it.

The inability of illiterate woman to make a correct choice - to ensure the health of their children, their own health and of their children, inability to plan for the future security for the family leads her to reject the tremendous pressures that the government exerts today on family welfare programmes and thereby seriously endangers her own health.

THE FAMILY PLANNING PROGRAMME:

India is one of first countries in the world to have a major national family planning programme. Enormous resources have been spent on it - in the last five years plan period alone - more than 3000 crores have been spent on the programme. Nearly half the budgetary allocation for health care goes to family planning - yet the programme has not succeeded. The crude birth rate over the last 10 years has remained static at about 31/1000 as against a 22/1000 that it was supposed to reach. In other words despite Rs. 3000 crores spent, there has been almost no change at all in birth rate. The message of family planning has been literally taken to every corner of the country, roughly to every village and every home - to meet with only a poor response.

The reasons for this need to be understood. The poor do not choose to have many children because they like it. Labour, childbirth and rearing of children is tremendous strain for every woman, especially those who need to work for a living as almost all poor women in India need to. Yet to a poor family, which earns just enough daily for bare survival children are the only long term investment or savings they can make. When they are old or sick it is only their children that they can fall back upon. (In a better income group in our country or in more developed countries savings are in the form of a home, a bank, pension, provident found etc.) When 10 out of 100 children die, the need to ensure a living child and a male child in particular becomes a matter of paramount importance. The loss of a child for a mother is a matter of great agon and guilt, for the being she brought into there world and loved so intensely is lost as she was unable to protect it. But the millions of mothers are voiceless and we do not hear them cry. And even as they cry they need to go through it again to bear more children.

Only in a society where there is social security and low infant mortality will the birth rate come down. And only in a society where the woman is literate and liberated enough to make her own choices will family welfare be realized. There are countries like Cuba where there is no Family planning programme at all yet the birth rate is low. There is no population problem in any of the developed countries of the World. Indeed all of them want more people. the day our women are educated, the day they are able to ensure the survival of their children and become active participants of social development, that day family planning will become universal. Till then all we can do is to ensure easy access for every mother to health services which include family planning and information about family planning. the money being wasted on many of the schemes be better spent on educating women, providing basic health care and on development programmes.

PREVENTION OF ENDEMIC DISEASES :

A good knowledge of the way diseases spread consequent to the advancement of medical science have also helped us completely eradicate some diseases like small pox which once killed millions of people every year. It has also made it possible for us to eradicate or control many others. Take the guinea worm, for example, with existing knowledge and technology resources it is possible to completely eradicate the disease came by it orvernight.

Or take leprosy, we have a third of all leprosy cases in the World, and nearly all of them are in Tamil Nadu , Andhra and to a large extent in the eastern and southern states. It is possible with early diagnosis and treatment to eradicate or at least seriously limit this disease.

Or take endemic giotre which is limited to the foothills of the Himalayas, the Terai area, and north eastern regions. This is a disease that causes children to be born mentally retarded due to lack of iodine in the diet. Provision of iodized salt alone could totally eradicate the problem. (The details of prevention of a few endemic diseases specific to that area must be undertaken at this point).

FUNCTIONS OF HEALTH SERVICE:

When one of us as an individual suffer from of these diseases there is little to be done but to see a 'doctor. But let us never forget that in most instances,had we acted together earlier we would have taken measures or forced the government to take masseurs that would have ensured that none of us ever, suffer from that disease at all. However, when we do fall sick we do need a trained person to examine us and tell us what our ailment is? Is it just a common cold that will pass off by itself?

Is it jaundice? If it is jaundice, is it the type which we must commonly see, which in most cases becomes alright by itself provided we take rest and proper diet or is it a different variety which requires treatment or very rarely even an eration? We all need to know something about the common diseases, but knowledge about diseases is now so widespread that some people be it a community health worker, a nurse or a doctor, are needed whose profession is to provide health care.

There are many diseases that we get due to our body's own mechanisms being inadequate-either due to defects inherent in our calls or due to the body being unable to cope with an overwhelming external factor. Good medical care helps our body its normal function or at least ameliorate the symptoms thereby lessening the suffering caused by diseases. Often medical science is inadequate to do either, and we need to accept the limitation of this science and adjust our lives accordingly.

Death is inevitable. Medical science can prevent a number of preventable deaths, postpone it and make it less agnoising. The function of health services-the para medical workers, the doctors and nurses, the primary health centres and hospitals, the diagnosis equipment like X-rays is to find the causes of our aliments, to educate us about these causes and their effects, cure us wherever possible and relieve us from suffering when only that is possible.

EQUITABLE DISTRIBUTION:

Unfortunately though there are tens of thousands of doctors,and even some of them are unemployed, the vast majority of our people have no access to health care. Those who are rich enough to pay and live in cities have access to the best equipment and drugs and doctors and they consume the major part of what is spent for health. The poor especially those living in our villages have no access to any medical care. Even if there is a primary health centre nearby, it is understaffed, equipped and usually lack basic drugs needed to provide primary health services. The general hospitals are overburdened and are terribly unsanitary places,the medical staff overworked and the health care provided mostly inefficient.

COMMUNITY HEALTH WORKER:

It has been repeatedly stressed that proper access to medical care must be based upon developing adequate numbers of suitably trained and motivated community health workers. A community health worker is a person of your own village, who has studied at least upto 6th standard in school, who is trained to recognise common illness and treat them. He can also recognize more serious illnesses for which he will advice you to see a doctor. He will also be able to assist at delivery, immunize children and provide advice regarding prevention of other diseases. He may be a peasant who works his land who only spends few hours per day on such work or a local tradional healer or dai, trained for this purpose.

The presence of such a person in your village means that you need not run to a doctor or to a far off centre, but can have basic health services at your doorstep from person you trust. Does your village have one such worker, who is easily accessible to you when you or your child has a health problem? It not you must ensure that one person in the village be trained, for it.

DRUGS:

Drugs too are essential-especially for diseases like malaria, tuberaclulosis, leprosy etc., It is enough if there are 25 or so different essential drugs available within a kilometer of any habitation for treating most of the common diseases we get and to prevent many others. For more services and for less common diseases, when these 25 drugs are not adequate, one can go to the the district or taluk hospital. Even here no more than some 150 drugs are needed to take care of all the possible medical treatment you may ever need.

Unfortunately in most places including these 25 primary health centres these 25 drugs are not available. Even at the taluk and district level hospitals often these 25 drugs are not available-not to speak of the 150. But at the same time every local drug shop and even at the village level are freely available along with hundreds of other tonics, in injections and tablets which are of no use at all. Because people do not know the causes of their diseases they often take tonics and others tablets for feeling better or stronger. But these medicines wasts our money. Then why are they these at all? Why do doctors prescribe them? Why do governments allow them? Who do companies manufacture them?

Of all these questions only the last has an easy answer. The company make them because they get a lot of money by selling them. We need to ensure that our governments and doctors do not encourage such useless drugs that waste our money. We also need to insist that the drugs essential in that area are cheap and easily accessible.

OF DOCTORS:-

Last of all, we need doctors, too at least in every primary health centre there must be two doctors - doctors who are interested in serving the people. They can help when our own knowledge and training and that of the community health workers is inadequate. Doctors are also needed as scientists to find out more about the causes of diseases so as to discover ways to prevent the diseases and to treat them. In every district there should be art atleast one hospital where modern scientific instruments and specialists in various fields are available to treat serious conditions or rare diseases. They also need to provide training to newer health personnel and educate people about he causes of ill health and the way to be healthy.

HEALTH PRICES:-

If many doctors today do not do this it is also because amongst other factors the people do not know enough to ensure it. We need to know what we need for being healthy and what we need to prevent disease, and we need to organise and equip ourselves to ensure it. Unless we are literate and we can participate with understanding in the formulation and implementation of our health care programmes we will never be able to ensure our health, nor have proper, equitable access to health or the other benefits that advancement in medical science have made possible.

Good health needs far more than doctors and drugs. The struggle for being healthy is a part of the struggle against conditions that make ill health possible. It is a struggle for good food, good water, a clean environment, for good employment and for leisure. It is a struggle for a better quality of life. Science gives us the knowledge and the possibility of making good health care available today but to make this a reality, society must be willing to redistribute available resources so that these basic needs for all are met. This then is the true meaning of Health for all by 2000 Ad.

CH-7

BUILDING THE NEW PARADIGM

- A Study-Reflection-Action experiment on Community Health In India

The Community Health Cell (CHC) is a Study-Reflection-Action experiment drawing upon the rich and varied experience in Community Health Care from all over our country. In the initial phase, two members of the existing team travelled all over the country interacting with Health and Development projects. The team now continues interaction from its base at Bangalore, Karnataka.

The Study-Reflection-Action experiment has been based on interactions which are open-ended, non-formal, non-threatening and a reflective exploration of past experiences nd future plans.

The purpose of the CHC experiment has been to build a frame work for an alternative approach to health care, based on a diversity of micro-level experiences. The attempt has been to look at philosophical assumptions, goals, methodologies, successes and failures, strengths and weaknesses, opportunities and threats in order to build the components of a new paradigm.

A necessary first step of this approach has been the experimentation within the team with a non-hierarchical, participator, mutually supportive effort in its working. This has led to democratic decision making which has a team-sustaining effect and smoother function. The team has a few full timers, while the part timers contribute at their convenience, such that their participation has a flexibility ranging from half-a-day contribution through alternate day work, to even alternate week contributions to the team. In addition, there are a number of associates on the CHC network, coming together off and on.

The catalyst process has generated activity for the CHC team, ranging from participatory reflections, perspective planning exploration, issue-raising, networking, documentation inputs into training programmes, workshops, Seminars and Action Research on Community Health related issues.

The CHC team participates with individuals, whether health professionals or otherwise, field based project groups, Resource and Co- ordinating groups and Government agencies interested in exploring Community Health Action in its various dimensions.

The topic range spans Rational Drug Therapy, Alternative medical education, community health training, Environmental health issues, Health Policy matters, Medical Pluralism and

Integration of Traditional Systems of Medicine in Health Care and so on. In short, anything of relevance to Community Health.

The definition that is emerging from our interactions over six years is that,

> **"Community health is a process of enabling people to exercise collectively their responsibility to their own health and to demand health as their right. It involves the increasing of the individual, family and community autonomy over health and over organisations, means opportunities, knowledge, skills and supportive structure that make health possible"**

To make Community Health a reality, the present health superstructure has to be:

* more 'People oriented'
* more 'community' oriented
* more socio-epidemiologically oriented
* more democratic and participatory, and
* more accountable.

The paradigm shift is to be in our thinking of health and health care from the orthodox medical model of health to understanding, appreciating and practising a social model that will tackle health problems at its deeper roots. This shift of emphasis should take place at all levels and at all dimensions of existing health care planning and management.

The Technological/Managerial components of the new Paradigm include:

* Appropriate Technology for Health
* Community organistion and participation in Health
* Community/Village Health Workers
* Involvement of Traditional Healers, Dais and Indigenous systems
* Education for Health
* Health with Integrated Development
* Community support to Health Care - - financial/resources.

The critical values/issues of the new Paradigm include:

* Social Analysis, conflict management

* Individual/Community autonomy

* Medical Pluralism

* Accountability and socio-medical audit of health services

* Demystification and skill transfer

* Community building efforts

* Participatory Team decision making.

Despite some negative trends like Commercialisation of medicine, mushrooming of medicalised health projects, verticalisation of health efforts and cooption of Health by status-quo forces, it is heartening to note an emerging growth of people/project/group aware of the deeper dimensions of Community Health symbolised by:

a. new approaches in Government policy reflections

b. a growing base of village health workers,

c. involvement of non-medical health activists in health care issues.

d. health issues becoming part of the education process, and

e. health issues emerging in other movements, like the Science, Environment and Women's movements and so on.

A time has come to take critical stock of the Community Health Action reflection and experimentation in India and identifying the enabling/empowering dimensions so that groups like the peoples Science Network can build their health action efforts within this emerging paradigm. Ultimately all Community Health action initiators have to ask themselves the following three questions:

1. Will we work together to put pressure on the established medical system to commit itself to this new vision of Health Care?

2. Will we work together to put pressure on 'Health Policy and decision makers' to move beyond policy statements and get community health oriented programmes and actions off the ground?

3. Will we work with the people and their organisations to enable and empower them to get the means, structures, opportunities 'skills' knowledge and organisations that make health possible?

All these are unanswered questions. Micro level experiments have shows that a lot is possible, but macro level change requires a collective understanding and a collective vision.

WE EARNESTLY HOPE THAT THIS PEOPLES' HEALTH SCIENCE CONGRESS WILL BEGIN THIS PROCESS.

References

This working paper is based on five key papers of Community Health Cell which are available on request for all those who wish to explore these ideas further.

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Numbers in brackets indicate pages.

Please write to author,

SCIENTIFIC AWARENESS FOR PEOPLES' BENEFIT - CHAI'S CONTRIBUTION

Catholic Hospital Association of India

Catholic Hospital Association of India is a national organization of 2,222 member hospitals, dispensaries, health centres and social service societies spread throughout the country. Our member hospitals are noted for quality and efficiency of services and utilization of the latest technologies and advancement in medical science.

Very often, missionary sisters and priests set up these institutions in needy areas where suffering humanity had no other health care option. Some of them started in a very humble way and grew into impressive institutions. It was the compassion and healing spirit of Jesus Christ that motivated them to go to remote rural areas and the perpipheries. But as the years pass a critical evaluation makes us realise that some of us have lost the original vision and commitment to the people. Survival and maintenance of these institutions became the focus of attention. Sophistication and incorporation of advanced medical technology turned out to be the answer to survival. Some of these modern changes are not affordable by the poor majority and the fact remains that we fail to realise the additional burden we place on the poor on account of this.

CHAI holding on to its original vision, endeavors a critical analysis of the health status of the country in terms of the socio-economic and political situation. Very often many of the health problems ultimately are due to an unjust distribution of land, unequal sharing of profits, exploitive marketing systems and unfair wages. This results in the poverty of many and surplus for a minority. It is this poverty-stricken majority that suffer from malnutrition, recurrent illness and chronic diseases when unattended. Women of this majority undertake hard labour inspite of carrying a baby in an anaemia body. They deliver a low birth- weight infants who continue to be under weight and succumb to many infantile diseases.

They are unimmunized as their parents do not know of its importance, they are bitten by mosquitoes carrying malarial parasites. Ditches and puddles around their huts breed mosquitoes in plenty. They are fondled and cared for by elders who cough out tuberculous bacilli. Their weaning foods are mixed with water drawn from the village pond which carry any number of Rota Virus, Amoebic Cysts, Round Worm Ova, Heaptitits Virus, Typhoid and even Cholera Bacilli.

Out of whatever little money their parents earn toiling many hours in the hot sun, a good share is spent at the local arrack shop which is run quite profitably by the rich business class. This business class will see to it that no saving schemes survive in the village as it renders the poor villagers stronger to face up to any financial crisis. Only when such saving schemes

collapse, the poorest of poor fall at the feet of the money lender and become more and more chained to him.

Health can never be a reality in such a viciuous circle. No amount of medicines or efficient medical staff can ensure the total well-being of the community.

In the light of the above analysis, we realise that unless people take care of their own health, HEALTH FOR ALL BY 2000 AD will be a myth. It is this "enabling" process that CHAI has been faciliating through many of its programmes. Ultimately we depend on "empowered" Communities who understand their health problems and take appropriate remedial measures. We believe that the poor can do "something" for themselves and they are "somebody" in society. The poor man with a number of miseries, a great deal of incapacities and innumerable needs stands before us as a man who has lost his dignity. We want people to rediscover their dignity and self-esteem. They should also rediscover their potential in achieving remedial changes.

Our awareness building programmes are aimed at raising a critical consciousnesses level of the community so that they will be analysing question and challenge people on various relevant analyse issues. Based on the community's awareness and thus facilitate to take up appropriate action plans. A rational approach to such action plans is always insisted upon, based on a prioritization. Those health activities which will bring about the maximum desirable change in society and those activities which require minimum resource inputs deserve a high priority. If people are involved in health activities it becomes a people's movement. It is this movement we are facilitating through our orientation sessions, training programmes., follow up and evaluation and replanning of various projects. Many of our hospitals are being reoriented towards community based health care programmes. Many institutions have taken up training of local community health volunteer to increase the army of the community health movement. At a national level we organise programmes for leaders of community health projects. We also identify appropriate resource persons in various parts of the country and strengthen regional resource team for training more workers.

CHAI has taken the leadership in coordinating many of the isolated health activists groups and promoting linkages among them. We also facilitate exchange programmes among people based health movements of other countries such as Philippines, SAARC Countries, Latin America etc.

Another attempt of ours is to influence the donor agencies in America, West Germany, Holland, Switzerland, etc. to direct more funds to 'people based' health programmes rather than to the sophistication of big institutions.

RATIONAL DRUG THERAPY: Drugs being one consumer item in which the consumer has no say in the selection and use was our major concern for many years. This consumer item was misused widely knowingly or unkowingly. The prescriber has to swing into operation ethical principles considering financial status of the patient, cost benefit ratios, actual indications side effects, availability of alternative drugs etc. Through various conventions, training programmes, our publication Health Action, we have promoted the concept of essential drug and rational drug thrapy. Many of our member hospitals have made a conscious attempt to remove all banned drugs from their pharmacies. Some institutions have a "Therapeutics Committee" which decides on the purchase of drugs and updating of the hospital formulary. However, the high pressure marketing technics of many drug companies have been influencing our institutions. In the field of quality control of available drugs, we do not have enough facilities to monitor and report promptly to member institutions. Even at the Government level only four states in India have adequately equipped drug testing labs and partial facilities in ten states. Ten states do not have any quality control test labs. To meet this lacunae in service, and ensure the quality of the drugs CHAI is planning to start a central quality control lab of its own.

The necessity of public opinion and consumer pressure on the prescribing doctor, for the effective implementation of rational drug therapy is quite signifIcant. Our publications including magazine "Health Action" continuously try to educate the masses in this regard.

CHAI had attempted to bring together the producers of essential drugs who also believe in Rational Drug Therapy. The plan is to form a cooperative body of these produces for pooled procurement of bulk drugs and ensuring steady production of good, quality essential drugs at reasonable prices.

MISUSE OF MEDICAL TECHNOLOGY:

We are protesting against misuse of any medical technology. The Amniocentesis for sex determination and the discrimination tracked against girls are strongly condemned. When Ultra Sound Scanning and CAT scanning became the fashion of the day and unhealthy trend to overuse them was noticed. The Doctor-Medical Technology Axis was unfavorable to the poor man. We also expressed our distress in the growing commercial corporate sector hospitals, especially by business groups and non-resident Indians. The value system cultivated in these institutions is damaging to the medical profession.

There are attempts to study and campaign against unnesssary surgical procedures such as caesarean, appendicectomies and unnecessary lab investigations.

OTHER INVOLVEMENTS:

Scientific knowledge must be popularized for the prevention of illnesses and for saving lives. The Oral Rehydration Therapy is one simple Rational Scientific technique which if

explained to mothers can save millions of dying children. We had organized a large number of regional workshops for paediatricians and paediatric nurses in reorienting them in diarrhoea management. Each hospital is supposed to start an Oral Rehydration Corner in their out-patient departments and in paediatric wards. An innovative attempt to expose ORT to the general public was undertaken in the twin cities of Secunderabad and Hyderabad by starting demonstration counters at railway stations, bus stands, post offices, museums etc. In the summer of 1989.

Immunization is another scientific technology that has to reach every common man to ensure a safer future generation. Social mobilization for immunization is one area to which CHAI had given emphasis last year. There was an overwhelming response from our member institutions for taking this up seriously.

We believe many of the herbal and home remedies practiced over generations in various parts of the country are effective. They are cheap and affordable to the people scientific bases of their action are yet to be discovered. A lot of research if undertaken in due course might generate many effective indigenous drugs eg., reserprine, vincristine etc. We encourage the practice of herbal medicine.

CONCLUSION: CHAI believes in peoples' welfare through people's power. This power of the people generates from awareness building and people's organization. Science movements contribute enormously to peoples' awareness.

PHYSICAL PROCESSES AT SUPER-HIGH ENERGIES (THE EARLY UNIVERSE)

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1. Introduction

This paper presents an account of the possible physical processes that can be associated with enormously high (and spanning a wide range of) energy scales (1 Mev - 1019 Gev). The only conceivable scenario for such super-high energy scales is the universe in its very early epochs. Physical processes at super-high energy, therefore, amounts to study of cosmology at high energies (or early epochs).

2. The Standard Model of Cosmology

The Present day generally accepted model of cosmology suggests that the universe is expanding from an initial stage when it was extremely hot and dense and also very tiny in size. This phase of the universe characterized by very high temperature, and consequently matter existing in the most elementary form (such as hadrons and leptons and possibly quarks and gluons), is estimated to have existed about twenty billion years ago. The temperature of the universe in this so-called model of cosmology gets to be arbitrarily high for time scales very close to the 'beginning' - referred to as the big bang. While the big bang itself is yet to be satisfactorily explained, it is nevertheless possible to imagine the physical scenario in the early universe from our current knowledge of nuclear physics, statistical mechanics and the general theory of relativity. This scenario is summarized in Table 1 given below.

Table 1

Thermal history of the universe according to the standard model of cosmologies

Temperature (K)	Energy	Time (Sec)	Physical Process	Epoch
?	?	?	?	?
10^{32}	10^{19} Gev	10^{-44}	Particle Production	Quantum Era
10^{28}	10^{15}Gev	10^{-36}	Baryon nonconservation	Grand Unification Era
10^{16}	1 Tev	10^{-12}		
10^{13}	1 Gev	10^{-6}		
10^{12}	100 Mev	10^{-4}		Hadron Era
10^{11}	10 Mev	10^{-2}		Lepton Era
10^{10}	1 Mev	1	Neutrino 'freezeout' and	
10^{9}	0.1 Gev	180	Nucleosynthesis	Nuclear Era
$4x10^{3}$	0.4 ev	10^{12}	Recombination, Matter -radiation Decoupling	
		10^{16}	Galaxy Formation	Matter dominated Era
3	$3x10^{-4}$ev	$3x10^{17}$	NOW	

The main evidence taken in support of the hot big bang cosmological model are (1) the expansion of the universe, (2) the existence of a microwave radiation background and (3) observed abundance of light nuclei.

The idea that the universe is expanding is based on the discovery in the 1920 is by Hubble that distant galaxies all show red shifts in their spectral lines, and the conventional interpretation that these red shifts are due to Doppler recession. The existence of a microwave background of radiation pervading all space around us was discovered experimentally in 1964. Measurements indicate that this radiation has an energy spectrum that is similar to the Planck black-body radiation corresponding to a temperature of about 2.7^{o} K, and is highly isotropic. These two phenomena, global expansion and the existence of an isotropic 2.7^{o} K microwave radiation background, taken together and extrapolated backward in time, suggest that the universe 'began' in a hot, dense phase of matter about twenty billion years ago. As the universe expanded, the temperature dropped rapidly. Throughout the first minute, however, the temperature was greater than ten billion degrees. Under these conditions atoms and nuclei could not have existed in their usual forms but were dissolved into their constituent elementary particles and electromagnetic radiation. By about the first three minutes the temperatures dropped to a value when the primordial protons and neutrons could combine to from nuclei of the helium atom (^{4}He). The lighter nuclei in the periodic table of elements like helium, deuterium, lithium must have been synthesized primordially in this way. The heavy elements, comparatively rarer in the universe, are believed to be formed inside stars during their evolution and during supernova explosions. Within the frame-work of the standard hot big bang model, it is possible to theoretically estimate the mass ratio of all helium (^{4}He) formed primordially to all hydrogen (which is the main constituent of the universe at the present epoch). This ratio is one in three, and agrees reasonably well with primordial helium abundance observed in a variety of stellar sites. Another possible relic of the hot big bang universe is neutrinos. When the temperature of the universe was in excess of about a hundred billion degrees, neutrinos could have been easily created and annihilated by means of weak interaction processes. Neutrinos are massless particles and come in various species(such as electron-type neutrino, Monotype neutrino, etc.) and have negligible interaction with matter. Now, with the expansion of the universe and the consequent drop in temperature, the scattering cross-section of these weak interaction processes as well as the equilibrium number density of the particles got reduced. So after a certain stage in the expansion, when the temperature was less than about ten billion degrees, the neutrinos would have formed a non-interacting background somewhat similar to the background of the microwave radiation. It is possible to theoretically predict the density of left-over primordial neutrinos using statistical mechanical arguments, and comes out to be

$$n_{\nu+\bar{\nu}} = 160 \ \text{cm}^{-3}$$

per species, of neutrino. However, since neutrinos have negligible interaction with matter, it is extremely difficult to verity the existence the primordial neutrino background. In recent times

suggestions, both theoretical and experimental, have been made that neutrinos are not strictly massless particles but possses a small rest mass. If this turns out to be correct, then the neutrino background assumes great cosmological significance. For one thing, it can then provide enough mass density so that the present expansion of the universe will eventually stop after a finite span of time, and will be followed by a general collapse. Secondly, massive neutrinos can serve as the 'missing mass' inferred in clusters of galaxies.

3. Physical Process at super-High Energies

From Tabe 1, we see that the energy scales in the early universe in the first few seconds were very high-much higher than the maximum energies attained in the terrestrial high energy particle accelerators. In order to understand the physical process that might have taken place at such early years it is necessary to have a theory that would tell us the nature of interactions among elementary particles at such high energy scales. Recent experimental successes of the gauge theories for the weak and electromagnetic interactions (the Weinberg-Salam model) and the strong interactions (quantum) chromodynamics) have encouraged the hope that these interactions may be unified in a general theory of all elementary particle interaction. In the picture provided by grand unified theories (gravitation is not included because of as yet unresolved theoretical complications), there is only one single force which manifests, at low energies, in three different forms. the weak, the electromagnetic and the strong interaction. But at sufficiently high energies, corresponding to temperature 10^{28} degree, these forces merge into one single force. Now, grand unified theories have quarks and leptons as the fundamental particle of nature, belonging to one single family of fermions. Further, there exists, in these theories a symmetry between the members of this family so that quarks and leptons may transform into each other. This implies that neither baryon number nor lepton number, which are conserved in physical processes at ordinary energies will be conserved at very high energies characteristic of the early universe. The concept at baryon number violation in particle interactions has in recent times, gained importance towards providing a natural theoretical explanation to an old puzzle in cosmology : the seeming asymmetry between matter and antimatter. The existence of antimatter is predicted on the basis of well established concepts of quantum field theory. For instance, for every elementary particle there is an antiparticle that is identical in mass but opposite in other properties such as electric charge. Particles and antiparticles have often been created and observed in high energy acelerators. However, observations on a large scale indicate an absence of any significant amount of antimatter in our galaxy, and this seems to be the case for other nearby galaxies as well. To understood how grand unified theories attempt to explain the symmetry between matter and antimatter, it is necessary it recall certain ideas regarding symmetries of physical laws. The first is the left-right symmerty or parity, denoted by p. It says that the laws of physics are invariant under p, that is, under a mirror reflection of all space coordinates. In the late 1950s it was experimentally found, however, that the parity symmetry was not valid for the case of weak interactions. It was then suggested that the laws of physics be invariant under a more general symmetry called CP, where C stands for charge conjugation operation which changes the electric charge of an elementary particle to its opposite value.

If CP-symmetry were universally obeyed, then there cannot be an imbalance between matter and antimatter. So far, CP-symmetry is found to be a 'good' symmetry criterion except in one known case: the decay of the long-lived neutral K-meson. CP-symmetry is thus an approximate symmetry and not an exact one. Hence, if we allow a small violation of baryon number conservation as well as CP- symmetry in the early universe or, equivalently, at very high energies, it is possible to start from a most natural initial matter-antimatter symmetric universe and subsequently build up a scenario in which matter at some stage becomes more abundant than antimatter, and this scenario has 'frozen in' ever since.

The variation of baryon number is a built-in feature of all the present models of grand unification. These theories in their simplest form, postulate the existence of certain heavy particles (mass 10^{15} GeV), called X particles, whose decay or exchange violate baryon number conservation. The amount of CP-violation that is needed for a net baryon generation enters as a parameter in all models. There is one more requirement for this scheme to work: departure from thermal equilibrium. This, however, comes about naturally during the course of the expansion of the universe.

The parameter that one wishes to explain quantitatively in discussing matter-antimatter symmetry is the ratio of baryon number density (as deduced from number counts of galaxies in a specified volume of space) to the photon number density (as deduced from the microware radiation background):

$$\eta = n_B/n_r \sim 10^{-10}$$

This ratio remains constant during the expansion of the universe as long as the baryon number is conserved and the expansion of the universe is adiabatic (so that the number of photons is unchanged). The basic idea is that the value of η has been 'frozen in' (or decreasing if there are departures from adiabatic type of expansion) since the time when baryon number violating processes were significant. Thus the scenario is as follows: at temperatures greater than about 10^{28} degrees baryon number violating interactions were significant and chemical equilibrium could be maintained despite the expansion of the universe. So at this time the baryon number density was zero, and the universe was symmetric in matter and antimatter. However, as temperature dropped below the abovementioned value, equallibrium could not be maintained. Consequently the value of η was frozen. The role of CP-symmetry violation is to ensure this net imbalance of matter over antimatter. Corresponding to every decay mode of an x particle there would be a decay mode of its, antipaticle x. This would then nullify any imbalance of matter over antimeter unless there was a violation of Cp-symmetry. Several quantitative calculations are now available [1-4] which, although not free from uncertainties in the parameters involved, do predict a value for η equal to $10^{-10\pm1}$.

The crucial element in the above scenario to explain matter- antimatter asymmetry is the concept of baryon number violation. The unified theories suggest the life-time for the proton decay process to be 10^{29} years. There are several experiments, including one at the Kolar Gold Fields in India, that have been designed to look for proton decay events.

Apart from baryon number violation, grand unified theories predict the existence of stable magnetic monopoles of mass 10^{16} Gev [5]. The existence of magnetic monopoles was suggested in 1931 by Dirac in a different connection, namely, to explain the quantization of electric and magnetic charges [6]. Until recently, experimental search for magnetic monopole has remained unsuccessful. Recently, however, an experimental evidence consistent with the detection of a single monopole, of one Dirac charge value and corresponding to a flux of 10^{-9} cm^{-2} sec^{-1} but mass undetermined, has been reported by Caberra [7]. This experiment gives a boost to the grand unification idea.

It should be noted, however, that magnetic monopoles, if they exist, would move along the magnetic field lines of the galaxy, gaining kinetic energy. The gain in kinetic energy would be compensated for by a corresponding loss in the magnetic field energy. If the monopole flux exceeds a certain critical value equal to 10^{-15} cm^{-2} sec^{-1}, called the Parker limit [8], it can be shown that the entire galactic field would soon be dissipated. Caberra has argued that the monopole flux observed in his experiment is consistent with the flux expected from a gravitational bound galactic halo of Dirac magnetic monopole of mass 10^{16} Gev. There is no definite contradiction in this, however, since it is quite possible that the sun, because of its gravitational attraction on the monopoles, enhances the monopole flux near its own neighborhood. Recently, Salpeter et al [9] have derived theoretical constraints on a hypothetical galactic halo of magnetic monopoles imposed by the galactic magnetic field: if the field is due to electric currents then a disk- stabilizing galactic monopole halo cannot exist unless there is the monopole mass / 10^{21} Gev and corresponding flux $5x10^{-15}$ cm^{-2} sec^{-1}. However, if the galactic field is due to monopole charge- density fluctuations then a halo can exist provided there is the monopole mass 10^{-17} Gev and a corresponding flux $5x10^{-11}$ cm^{-2} sec^{-1}. The latter seems to be the most stringent bound that can presently be set on the galactic monopole flux from astrophysical data. Magnetic monopoles have interesting consequences for the proton decay in that they can accelerate the proton decay rate [10, 11]. This depends upon the monopole flux and the nature of the monopole-induced proton decay interaction, which is not clearly understood at present.

In 1981 Guth suggested a new picture [12] for the very early stages of the universe which attempts to answer in a natural way, rather than postulating ad hoc initial conditions, some long- standing and fundamental cosmological puzzles which are left unanswered in the standard model of cosmology. These problems are: the homogeneity- horizon problem and the flatness problem. The homogeneity problem refers to the problem of explaining why the large-scale distribution of matter in the universe is homogeneous. Galaxies seem to be

distributed at remarkably uniform density. and the universe's rate of expansion seems little different locally from its value at the visible edge of the universe. If the origin of universe is to be traced to a big bang explosion, then there is no a priori reason to expect that the result of the explosion will not be turbulent and chaotic. The horizon problem refers to the puzzle as to why the universe is homogeneous irrespective of the direction of observation as borne out by the highly isotropic distribution of microwave radiation background, even though vast areas were casually unconnected in the past. The flatness problem refers to explaining why the deviations in the value of the matter density of the universe from its critical value for eventual recollapse after a finite time is very small at the present epoch, and has been so all the way back to when the age of the universe was 10^{-43} seconds (called the Planck time). It appears that the big bang explosion was matched so delicately to the attractive self-gravitating force of the universe that the galaxies had just sufficient speed to escape each other's gravitational pull and, at the same time, not so much as to promptly disperse away. To ensure this, a fine tuning of one part in 10^{60} is needed between the matching of the explosive and gravitational forces.

The basic idea of the model proposed by Guth is the existence of a universal repulsive force that is negligibly small at the present epoch but was very large at the time the universe was born. So, when the universe was about 10^{28} times hotter than now (corresponding to an age 10^{-35} seconds), this dominant repulsive force would trigger a runaway expansion of the universe, inflating it at an exponential rate and doubling the size every 10^{-35} seconds or so. As a result, any initial turbulence or uneven distribution of energy would be diluted and smoothed away. After the inflationary phase was over, the universe would emerge with a highly uniform distribution of matter, energy and motion. A feature of this scenario is the right prediction for the rate of expansion needed to explain flatness problem. Further, since the inflationary phase of the universe would bring into causal connection areas stretched over enormous scales, the horizon problem can also be explained.

Now, if the above picture is true, then the universe would cool rapidly as it expanded, thus allowing the strong, weak and electromagnetic focus to become distinct and diminishing the strength of the initial universal repulsive force. To avoid this Guth suggested that the universe supercooled by many orders of magnitude below the critical temperature of a grand unified theory phase transition. This is analogous to the super-cooling of water, so that it can remain liquid somewhat below the freezing point for phase transition to ice. An interesting feature of the inflationary universe scenario is that the inflated epoch could dilute the density of magnetic monopoles, abundant in the early universe, to a small and observationally permissible level.

The original version of the inflationary model required that eventually the bubbles of the new phase would coalesce to fill the space uniformly, a condition that is unlikely under plausible physical assumptions. Subsequently, it has been suggested by several authors

[13-15] that under a different class of grand unified theories, it is plausible that a single bubble or a fluctuation can undergo the right amount of inflation to avoid the problem in Guth's original proposal. There is still a snag however in the 'new' inflationary universe model, the universe emerges from the exponential expansion much too smooth to allow for subsequent development of inhomogeneities needed for formulation of galaxies. This is an area of much current research. So far, in discussing cosmology at extremely high energy scales and possible unification of the weak, electromagnetic and strong interactions during the very early universe, the gravitational interaction has been left out except in so far as it enters in the Einstein field equations to determine the time evolution of the universe's length scale. It is generally accepted that when the age of the universe was less than about 10^{-43} seconds, quantum mechanical corrections to the general theory of relativity would play an important role. At present, there is on theoretical consensus as to the exact role quantum mechanical effects have no gravitation. In some models, the initial singularity at the instant of the big bang persists, while in others it is removed and the universe bounces.

The nucleosynthesis prediction of the standard not big bang model turns out to be in good agreement with observed abundances of light nuclei: deuterium, helium 3, helium 4 and lithium 7 only for a restrictive range of values for η, namely.

$$\eta \sim 93\text{-}60 \times 10^{-10}$$

which corresponds to the total baryon density(Ω_B) amounting to 15 percent of the density needed for the closure of the universe (Ω_C). Now, abundances of deuterium, helium 3 and helium 4 increase or decrease monotonically with η, so that these are compatible with the case $\Omega_B = \Omega_C$. But, the lithium 7 abundance shows a minimum at η 3×10^{-10}. With the case $\Omega_B = \Omega_C$, one gets 'overproduction' of lithium 7 by nearly two orders of magnitude. So, a question that has been raised in recent times is "can quark-hadron phase transition in the early universe generate the desirable baryon number inhomogeneity to 'fix' the lithium 7 problem, taking $\Omega_B = \Omega_C$?. If so, this will not only be compatible with the idea of cosmic inflation, but may also provide an answer to the so-called dark matter problem in terms of stable, quark nuggets, without having to invoke such exotic particles as axions. It may be recalled that the dominant constituent (90%) of matter in the universe seems to be in nonluminous or dark form. This problem has been recently looked into by Rana et al. [16], assuming the scenario that the quark phase supercools below the QCD transition temperature (Tc) and it exists in the form of dense nuggets interspersed in a lower density soup of hadrons, attended by an evaporation of neutrons form the higher to the lower density regions. A similar value for the neutron-to-proton ratio at the onset of nucleosynthesis is obtained as in the case of the standard big bang model; furthermore this is found to hold for the case $\Omega_B = \Omega_C$.

The question as to whether quark nuggets will actually survive a Hubble time scale of the

universe's expansion has been discussed by several authors during the past few years. The calculations are uncertain because neutron emission and absorption rates are not likely to be the same as the universe expands. An exact model to describe the process is lacking, but it seems plausible that quark nuggets with physically interesting range of baryon number values may survive.

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SOCIAL LIFE IN INSECTS

By

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Man is a social being. We have always lived in social groups. Life outside of a social group is almost unknown to us. An individual human being can probably manage to stay alive even if isolated from all other human beings, but there is rarely an opportunity to test this. If a person does get cut off from the rest of the world and manages to survive in isolation, it makes history! There are many animals which are not unlike us in this regard. But sociality is not the rule in the animal kingdom. The vast majority of animals lead a solitary life and may or may not meet another member of their species except at the time of mating.

It may not be widely known that insects represent the most spectacular examples of social life in animals. Ants, bees, wasps and termites are four groups of insects that have developed the most advanced forms of social life seen in the entire animal kingdom. In the case of ants and termites, all known species are obligatorily social. Many species of bees and wasps lead a solitary life but others show varying degrees of sociality. The reason why insects are considered to show the most advanced form socially is that in many species, most individuals forego reproduction and work as slaves for the welfare of the rest of the group. This unique feature is nonexistent outside the insect world.

Social insects are of great interest to us. There are at least three reasons for our interest in them. The first is that social insects play a very dominant role in the natural world. A colony of the driver ant may contain as many as 22 million workers and weigh over 20 kg. A single population of a mound-building ant in the United States consisted of 73 nests and a total of 12 million workers which covered an area of 10 acres and weighed about 100 kg. Many termites build mounds that can reach a height of 20 feet and contain over 2 million workers. It is hard to believe that the biomass and energy consumption of social insects exceed those of vertebrates in most terrestrial habitats. Early Portuguese explorers of the Amazon valley described the ants they encountered, variously as "King of Brazil" "The actual owners of the Amazon valley" and "The real conquerers of Brazil".

A second reason for our interest in the social insects is their social organization. It is not surprising that we humans should be keenly interested in how members of other species run their societies and solve the inevitable problems that come with group life. No society can function without a set of rules and no society is likely to be devoid of individuals who break rules. What then are the rules that govern and make possible insect societies? Could it be that these rules are enforced in some manner not different from what we ourselves do? Given the

limited number of things that an insect can do (it cannot design a car or a machine gun, for example!), the efficiency with which insect societies are organized is mind-boggling.

Let us consider the example of honey bee. A nest may contain upto 50,000 slaves or workers. They are all female bees who are born sterile and work for their colony with what must appear to us as complete devotion. The tasks that a worker honey bee performs are accurately programmed both in time and space. Young worker bee is not capable of doing much during the first two days of its life and yet it does not idle. It stays close to the cell from which it has emerged and cleans the nest. In about two days. tiny wax glands in the abdomen of the worker bee begin to develop and now this two-day old worker becomes a builder. It uses the wax to repair damaged cells as well as extend the comb by building new perfectly hexagonal cells. In another few days, the worker changes its role and begins to feed the growing honey bee larvae, of which there may be as many as 10,000 in a healthy nest. The efficient builder now has to become an even more efficient nurse. The quality and quantity of food that have to be given to the honey bee larvae are often quite varied, depending on the age, sex and future caste of each larva. From a nurse, the worker then moves towards the periphery of the nest and takes on the job of unloading pollen, nectar and water that is being brought by the foragers. This is no mean task either, for it is upto the unloader to ensure that the nest receives just what it needs. The foragers bring back what they find but if the nest has plenty of pollen but is in dire need of water,this is communicated to the foragers by the utter disregard shown towards foragers bringing pollen. When nobody receives the pollen that it has brought with any degree of enthusiasm, the forager realises that pollen is no longer in demand and tries to bring something else. In this fashion, it ultimately hits upon just what the nest needs.

After working for about 20 days within the nest, the worker bee ventures out and becomes a forager. Its task now is to scan a large area around the nest(often upto several square kms) for pollen, nectar and water. It may be obvious but it is not a trivial matter that the forager has to find its way back to the hive. To do so, it has an elaborate procedure of using the sun as a compass. Having found a large tree in bloom, a single forager bee would only be able to carry a miniscule fraction of the pollen and nectar that this tree may have, before other bees from other hives start doing the same. The forager therefore goes back to the nest and performs a dance by means of which it communicates information about its find, including its location and distance from the nest to its nestmates. This makes honey bees the only creatures other than man to use a symbolic language to communicate with other members of their species. The bees which have watched this dance can now locate the tree in bloom with no further assistance from the dancer. As a consequence, hundreds of bees now find this tree and efficiently transport its pollen and nectar to their nest.

A question that poses the most serious challenge is how all of this is regulated and supervised.Obviously, the answer is not clear,but regulation seems to take place at several levels. First, bees like most insects, are largely guided by instinct and are thus genetically programmed to undertake most behaviours. Even the age-dependent changes in behaviour are brought about by automatic changes in the hormone levels of the bees, somewhat like changes in human beings that occur at puberty. But that is not all. The queen bee who is the mother of all the workers, is known to mate with several males. The workers in a nest thus often have different fathers, and along with their father's genes, they bring different behavioural tendencies and task specializations. This provides sufficient diversity within a nest and makes the group as a whole good at everything. Apart from all these somewhat remote controls, there is also a more direct control. The queen constantly produces an array of chemical substances which get distributed to all members by means of those workers who are constantly feeding, licking and cleaning the queen. These chemical substances control the behavior of workers by guiding, instructing or preventing them from performing various tasks as appropriate. The way in which new queens are produced is a good example. Normally, when no new queens are required, the present queen produces sufficient quanitity of a chemical substance called the "queen substance" and this prevents worker from constructing the large queen cells which are required for rearing queens. When new queens are desired, the present queen stops producing this substance. Now workers are no longer inhibited from building queen cells. The workers are also programmed to feed a special substance called the"royal jelly" to all larvae in the queen cells and larvae fed on royal jelly become queens. It is not just an amusing sideline but a particularly intriguing observation, that the male bees which are called drones, take virtually no part in the social organization of the nest.

The third and perhaps most important reason for our interest in social insects is the question of the evolution of their social habits. This is because the evolution of social life in insects constitutes a paradox. It is difficult to imagine how the process of evolution by natural selection which depends on the "survival of the fittest" can give rise to sterile workers who sacrifice their reproduction for the welfare of others. Why does not every individual try to reproduce on its own, even by being solitary if necessary? How could sterile workers leave behind more progeny as required by Darwin's theory? My own interest in social insects stems primarily from this paradox. To study this question,however, the honey bees, ants and termites are not very helpful. In all of these, the social habit was developed millions of years ago and today the stenle workes are trapped in their new roles - Their anatomy and physiology have changed so much that they are quite incapable of becoming solitary and often cannot reproduce efficiently. I have therefore preferred to focus my attention on some species of wasps which are considered primitively social. These wasps also live in intricately organized societies with a queen and sterile workers but there is an important difference. The

workers among these wasps are not very different from the queens in their anatomy and physiology. All individuals look alike and most individuals can become either workers or queens depending on the opportunities available.

A young female wasp, unlike a young worker honey bee, has several options available to it. It can leave the society in which it was born, become a solitary individual and start reproducing. Alternatively, it can stay in the society in which it was born, become a worker and help its mother to continue reproduce. So it is reasonable to ask the question why most individuals do not leave and become solitary individuals. Earlier work by other scientists had suggested two possible reasons for this. One is that, by staying back on the nest in which it was born, a wasp has the opportunity of taking care of very close genetic relatives and this may be as good as or better than direct reproduction. Research in my laboratory has shown that this is not a valid argument. Because the queen mates with several males, a wasp that stays back on its mother's nest, is often forced to take care of individuals who are not very closely related to it. The second suggestion was that some individuals are born so weak that they cannot go off and reproduce on their own. Research in my laboratory has shown that this is partly correct but it is not the entire explanation. Many individuals that can reproduce on their own also stay back and become workers. We have found that quite frequently one of the workers is able to chase away the existing queen and take over the role of the queen. In addition, some workers are able to somehow take a portion of the worker force with them, start a new colony and become the queens there. I think, therefore, that many individuals stay back on the nest of their birth because of the hope of becoming queen in the future. Not all of them realise this hope, but those that do, are so successful at reproducing that the gamble is worthwhile.

FRONTIERS IN COMPUTER TECHNOLOGY

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INTRODUCTION:

The developments in computer technology has normally been described in terms of the so-called computer generations. This term has been widely used most often in relation to the electronic devices used to construct computers. We will, however, take a broader perspective and consider besides electronic devices used, the storage technology used, the mean time between failures (MTFB), the evolution of software and applications through the various generations. In the first generation the devices used were vacuum tubes. The memory was made up of acoustic delay lines and later magnetic drums. Tubes were not very reliable and consequently the mean time between failures of the computer was about an hour. The machines were programmed using machine codes or assembly languages which were one to one transformation of machine code. Early applications were mostly for scientific and engineering calculations. A big revolution took place in the second generation of computers due to the advent of transistors. Reliability of computers dramatically increased. This coupled with the invention of magnetic core memories made the use of high level machine independent languages such as FORTRAN feasible. This led to a rapid growth in computer usage in both science and business. The next step was more evolutionary. Transistors were replaced by integrated circuits with a consequent reduction in cost and ten fold increase in reliability. High level languages improved and were standardised by international standards organization. From a user's point of view a major advance was time sharing of computers with consequent interactive use of computers. The interactive use led to tremendous increase in the productivity of users as they could build models in close association with the computer. Currently we are in the fourth generation which is characterised by the microcomputer revolution. Large number of microprocessors are used in personal computers, in sophisticated instruments and even in household appliances. Other major characteristics of this generation are the advent of graphics and of computer networks. Table 1 is a comparative summary of the characteristics of the four generations of computers.

VON NEUMANN ARCHITECTURE

Computers have become faster, smaller and cheaper but one fundamental feature has remained invariant throughout the four generations. This is the basic logical structure of the computer which was proposed by Von Neuman in 1946. This logical structure also known as architecture is characterised by the program being stored in a central main memory and interpreted sequentially by the central processing unit. Another central concept in this architecture is the identification of a variable by a storage location which gets updated by

program overwriting the contents. As a consequence of this logical structure of the machine, mostly sequential algorithms have been designed. Many Many algorithms are characterised by extensive use of loops, which are inherently sequential and involve dynamically changing the state of the memory. The correctness of alogrithms is difficult to establish as these alogorithms do not satisfy many universally understood mathematical laws. Computer languages are designed to efficiently represent alogrithms and consequently are sequential languages.

SOFTWARE CRISES

A major problem in the use of computers has been escalating cost of software due to the need for skilled programmers whose productivity is constrained by the available languages which require attention to clerical details. The major criticism of the current state-of-the-art of computers is that even though machines have become cheaper, very powerful and highly reliable, they have not become easier to use in the same proportion. In fact, current architectures inhibit thinking in "parallel" i.e., preceiving what could be done simultaneously and what need to be done sequentially. They also inhibit program proof procedures and consequently lead to unreliable software. Further the current methods of program development have too much emphasis on how to procedurally solve a problem and mixes up the two concerns: What problem is to be solved and how to solve it. It has how been realised that if the productivity of programmers is to improve dramatically there is a need to shift the emphasis of programming to precise formulation of the problem to be solved - namely problem specifications. A built -in translator must then convert the specification to detailed procedure. It would also be useful if program acceptance criteria are stated alongwith program specification so that the testing of the translated "object program" is easily accomplished. Thus new languages are needed to specify algorithms without the inhibition of a pre-conceived logical structure of a computer. This is one of the goals of fifth generation computers - namely to develop specification oriented languages. If a logically good notation for such a language is developed then one may be able to use the same languages to specify application - translate it for implementation and prove its correctness.

MULTI-PROCESSOR ARCHITECTURE

The second major problem with the current computer architectures is the limit to their speed imposed by physical constraints such as the velocity of light. There are two ways of increasing the speed of computers. Both of them involve use of multiple processors to do a single job. One method is to break up a job into a number of independent sub-tasks and allocate each sub-task to one processor in a chain of processors. The sub-tasks are done sequentially by processors in chain. A stream of jobs are sent to the processors in the chain. As all processors work simultaneously on different sub-tasks the total time taken to do the jobs will be reduced. This is known as pipe lining. This method will work only if we do a large number of identical jobs. Another method would be to do several jobs simultaneously by

allocating one job each to many processors. All the processors can work simultaneously and independently thereby reducing the time to carry out the job. Both these ideas are being explored extensively for building fifth generation computers.

Another significant development in technology is the feasibility of designing custom made very large scale integrated circuit chips for special applications. This made it economical to build special purpose computers extremely inexpensively. Such machines have been built for solving partial differential equations, simulate planetary motion etc.

KNOWLEDGE BASED SYSTEMS

The phrase fifth generation computers was coined by the Japanese to get goals for a nationally co-ordinated research and development programme with the goal to become world-leaders in computer technology by 1990. An organization called ICOT (Institute for new generation Computing) was set up with cooperation from industries, research laboratories, universities and the government. The Japanese foresee that in the next century Knowledge processing Industry will be the dominant industry replacing heavy industry of today. Thus their main goal is to develop a new computer which will not merely be a data processor but will be knowledge information processor.

The main goal of the project is to develop tools and techniques for knowledge information processing. As a first step in developing such systems, knowledge bases are required. In current computers we basically develop data bases and process these data bases. The difference between a data base and a knowledge base is brought out by the following example. Suppose a large number of experiments are carried out and data collected. The data can be organised systematically as a data base for easy retrieval of desired data. If the data base is combined with a set of inference rules which will allow us to explain the experimentally obtained data base as a consequence of physical laws(s), then these inference rules alongwith the data base is much more powerful and constitutes a knowledge base. The inference rules can be derived only by knowledgeable experts in the area and will be valuable asset. An example of such an inference rule would be

"IF car does not start and battery is OK and ignition systems OK and carburretor OK then check petrol line"

A collection of such knowledge bases in diverse areas will increase the competitive edge of a nation enormously.

To achieve the main goal of the project, it is necessary to develop superspeed computers which would be able to process large knowledge bases. The main output obtained by processing knowledge bases would be logical inference. It is necessary to carry out dozens of

instructions for each knowledge base. As was pointed out earlier in this article, distributed asynchronous computers would be needed to achieve these high speeds. Such architectures known as non-von Neumann architectures will achieve speeds in the range of billion inferences per second.

INPUT - OUTPUT

Currently the types of input and output devices which can be connected to a computer are restricted. Inputs are mainly via keyboards or magnetically recorded media such as floppy disks. Outputs are either printed pages or displays of both alphanumeric information and graphics on video terminals. A more natural way of human communication would be by speech, handwritten documents and pictures. One of the goals of the fifth generation computers is to develop new input/output devices which would recognize speech, pictures and handwritten inputs and give answers in spoken as well as pictorial form besides printed form. To meet this goal would require building complex speech and picture recognition systems. Such systems require complex inference mechanisms as most human speech is not well structured and there is considerable difference in speed patterns of individuals.

Lastly to meet the goal of high speed computing, extensive developments in electronic devioe technology and computer aided design of electronic systems are needed. Japanese goal is also to invest massively in this area to obtain the required electronic systems.

FIFTH GENERATION

A block diagram of the proposed fifth generation computing system is shown in Figure 1. This figure succinctly summarises the proposed features of the machine to be developed. Currently forty of the best Japanese engineers drawn from many industries and research laboratories are working in Tokyo in the Institute for new generation computing and their goal is to build this machinery by 1990. As a response to this, Japanese challenge groups have been formed in USA, U.K. and Europe to develop their own versions of such a machine. It is hoped that by the turn of this century such machines will become a commercial reality.

CONCLUSION

To conclude, Table 2 shows a summary of what may be the fifth generation. This Table does not fully bring out the true spirit of the fifth generation, which is to let scientists and engineers concentrate on formulating clearly what questions they want to ask and why they want to ask them rather than spend a lot of time on working out in detail how the computations are to be carried out. The more intelligent computers of the future will assist in working out the details of computation by picking the right algorithm, the right programme and knowledge bases using expertise built into them,

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Year	Switching Device	Storage Device	Switching time	MTBF
1990 (?)		Associative Memories Optical Disks. Tens of Giga bytes of distributed storage	~ 0.1 nsec. speed measured in Giga Lips	10000 Hrs.
Software Functional programming (Specification Langauge) PROLOG Personalised expert systems		Applications Primarily knowledge Processing oriented applications		

Table 2 : Fifth Generation Computer characteristics

Generation	Years	Switching device	Storage device	Switching time	MTBF*	Software	Applications
First	1949-55	Vacuum Tubes	Acoustic delay lines and later magnetic drums. 1Kbyte memory.	0.1 to 1 millisecond.	30 mts. to 1 hour.	Machine and Assembly languages. Simple monitors	Mostly scientific. Later simple business systems.
Second	1956-65	Transistors	Magnetic Core main memory, tapes and disk as peripheral memory. 100 Kbyte main memory.	1 to 10 micro-seconds	About 10 hrs.	High level languages. FORTRAN, COBOL, Algol.Batch operating sytems.	Extensive Business Applications. Engineering Design optimiza -tion, scientific research.
Third	1966-75	Integrated Circuits (IC)	High speed magnetic cores. Large Disks (100 MB). 1 Mbyte main memory.	0.1 to 1 microsecond	About 100hrs	FORTRAN IV, COBOL 68, PL/I. Timeshared operating system.	Data Base Management systems. On-Line systems.
Fourth	1975 - present	Large Scale integrated circuits. Micro processors (LSI)	Semi-conductor memory. Winchester disk. 10 Mbyte main memory. 1000 Mbyte disks.	10 to 100 nanoseconds	About 1000 hrs.	FORTRAN 77, Pascal, ADA, COBOL-74, concurrent PASCAL.	Personal computers. Distributed systems. Integrated CAD/CAM. Real time control. Graphics oriented systems.

* MTBP - Mean time between failures of the processor.

Table 1- Computer generations-comparison

WE AND OUR WATER RESOURCES

BY

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We all know that water is indispensable for maintenance of life as well as for a wide range of human activities in agriculture and industry.

Let us see how much water is available to us. The water is always in circulation through the hydrological cycle, consisting of evaporation, vapour transport by wind, rainfall, flow in rivers, infiltration into ground and so on. However, the amount of water in any part of the cycle in a given region keeps varying. Floods and droughts are manifestations of this variation.

We get our water from the surface, as well as from below ground. Rainfall is the source for both these forms of water. The average annual rainfall in Karnataka is 1035 mm out of which roughly 35% flows in river as surface water, 10% percolates into groundwater and 55% is held in the root zone of the soil and transpired by vegetation. If we take surface water alone, it amounts to 2435 cubic meters per year per person in our State. This compares favorably with several other regions, e.g., 2586/m^3 all India average, 1500/m^3 in Germany, 868/m^3 in Saudi Arabia, 184/m^3 in Israeil and so on. Since our streams become dry after the rainy season, all this surface water is not available to us. A part of it stored in tanks and reservoirs becomes available in their neighborhood for a part or whole of the dry season. The major use of this water is in irrigation.

The fraction of rain water percolating below the root zone, though smaller than that which appears in our rivers, is the major source from which our domestic needs are met, because it is available almost everywhere and for a longer period. Unfortunately, almost the whole of Karnataka forms a hard rock region, with very little capacity to store groundwater compared to, say, the Indogangetic plain. With rockbed only about 15 metres below the surface, the groundwater flows down the slopes and wells become dry in many parts of the state during the last few weeks or months of the dry season. In several places, more groundwater is pumped out than the recharge. In recent years, water from the fissures and fractures in the rock is being tapped through increasing numbers of bore-wells, and as a result, the water table is getting lowered and open wells are becoming dry. Ground water is thus becoming more difficult to get, and every summer people and animals experience hardship in many places.

Although water availability seems to be enough on a per capita basis, we seem to be unable to get it when we want. This is due partly to the seasonal concentration of our rainfall, and partly to our failure to adopt proper management practices matching increasing population and industrial activity. Even available water is sometimes too polluted to be of use. The pollution of our rivers is mainly from domestic wastes, but industrial wastes do not lag far

behind. The risks of industrial pollution are often underestimated even in developed countries. Compared to the low level of industrial activity in our state and country, the degree of industrial pollution of our surface waters is very high indeed. At some places in Karnataka, mere contact with the river water is a health hazard during dry periods. Industry is generally reluctant to treat the effluents because the expenditure would reduce profits. But unfortunately for the people living downstream of a pollution source, the flow in the river decreases after rain stops, while industrial effluents come to the river throughout the year at more or less the same rate. As some body wisely cracked, dilution may be the solution to pollution, but where is the water to dilute during dry periods? While some action is being taken by the State Pollution Control Boards, antipollution measures must be more vigorously pursued.

Domestic wastes near cities are a major source of pollution. One can see practically untreated sewage flowing through streams downstream of most cities in our country. Besides rendering the river water unfit for use, this sewage contaminates fruits and vegetables to grow which it is used as irrigation water and manure. Pollution by sewage is thus a health risk not only for people downstream who use the river water for domestic purposes, out also to the people who produce the sewage since they are the ones who consume the fruits and vegetables grown with it.

Another source of pollution of river waters is the fertillsers and pesticides used in agriculture. Fertilisers and pesticides are washed down into rivers by rain water and excess irrigation water. 80% of our cultivable land is dry land and farmers who cultivate it are too poor to afford fertilisers or pesticides. The pollution therefore comes from irrigated land.

A polluted river has some capacity for self purification. This purification comes about because of the action of sun-light, oxygen and organisms in the water, and takes place as the water flows through some distance. Higher the concentration of pollutants, longer distance required for self purification. During monsoon, when the flow is large, the river stays polluted over short stretches while in the dry season, long stretches suffer from pollution,

Groundwater too is not free from quality problems. In many places the water has a high salt content, especially if it comes from a borewell. The salts in the rock or soil are dissolved in the water and may sometimes even cause deformation of bones over a period of time. In addition to this natural pollution, manmade pollution of groundwater can also occur. Polluted water from a river and leakage from sewers can percolate down to groundwater. Soluble wastes from garbage dumps will be taken by rainwater inflitrating into the ground. If this goes on for a significant period, the water bearing stratum will itself be contaminated, and it will be very difficult to clean it. Even after the source of pollution is eliminated, the wells will continue to yield polluted water.

Two questions arise regarding the quality and quantity of water we can get. Is it worth improving them? If yes, what should we do to achieve the improvement?

Availability of water in adequate quantity and quality has many advantages apart from convenience. Adults can do productive work and increase the wealth of the nation instead of spending their time hunting for water. Similarly, children can concentrate on studies Community health will improve, leading to increased producitvity and reduced pressure on medical services. One can also expect special situations to improve., It is therefore certainly worth improving water quality and quantity, especially since we have a reasonably good rainfall.

There are methods of realising this objective. The most important prerequisite, however, is the will of the people. People must realise that they have a high stake in ensuring clean and adequate water supply, and should be prepared to pay for it. Taking Bangalore as an example, people pay only 50 paise for 1000 litres, but it costs the BWSSB ten times as much to supply it. No one expects good quality and quantity in such a situation. People cannot escape paying the rest of the cost in any case, since ultimately it will be paid indirectly in the form of inflation, taxes etc. The indirect payment, however, will not go to the water supply board, and hence will not contribute towards maintenance of a satisfactory water supply system. With direct payment, people would have the right and means to ensure a good system. The same principle applies to village water supplies also. It costs a great deal of money to maintain the 120000 handpumps we now have in the State. If users are not willing to pay, the system will not work satisfactorily, however good the intentions of the government may be. People should regard the money they pay for water not as an expenditure but as an investment, which will repay them in the form of improved health and productivity.

The seasonal nature of our rainfall leaves no alternative but to construct reservoirs and tanks so that the monsoon flow can be stored for supply during the dry season. This will help in the lower valley regions. The uplands and ridge regions should adopt measures to augment groundwater recharge, which will be a major source of drinking water for them. These measurers consist of agricultural practices such as contour ploughing, strip cropping and bench terracing. These practices will serve to promote groundwater recharge as well as conserve the soil in dry lands, reducing the siltation of tanks and reservoirs. Other recharging techniques like percolation tanks, stream channel and basin spreading should be adopted at places where they are suited. A very necessary technique is to keep as much greenery as possible everywhere. For the quantity of rainfall we get vegetation cover in Karnataka is very poor because of exploitative grazing and tree-felling. People must grow trees and grasses wherever possible and try to keep farmlands covered with vegetation at the time of the first heavy showers of the year. Presence of vegetation improves soil moisture retention and groundwater recharge, and as a result stream flow will be maintained for a longer period after the monsoon. This may not increase irrigation water significantly, but it will substantially improve drinking water availability. The grasses grown should be properly managed by way of controlled grazing. This not only ensures that grazing land will always be covered with grass, but also availability of fodder.

GLOBAL WARMING

J. SRINIVASAN
Centre for Atmospheric Science
Indian Institute of Science, Bangalore.

INTRODUCTION:

The seven warmest years in this century occurred in the last ten years. This has focussed the attention of the scientists, politicians and people on the issue of global warming. The mean surface temperature of the earth has increased by about 0.5°C in the last 100 years. What are the factors that have contributed to this Increase? Some of these factors are, amount of solar radiation, cloudiness, ocean circulation, amount of absorbing gases in the atmosphere and dust in the atmosphere. The most important factor is the manner in which the solar and terrestrial radiation is absorbed in the earth's atmosphere.

"Green House" effect:

The glass in a Green house permits most of the solar radiation to pass through but absorbs most of radiation emitted by the surfaces within the Green house. This enables the Green house to be warmer than the surroundings. In the earth's atmosphere the two major constituents Nitrogen and Oxygen do not absorb radiation from the sun or the earth. Hence they do not play any direct role in influencing earth's climate. Three minor gases namely water vapour, Carbon di-oxide and Ozone have strong absorption bands in the infrared. On account of these gases, the gaseous envelope around the earth behaves like the glass in a Green house. It permits most of the radiation from the sun to pass through; but absorbs, most of the radiation emitted by the earth's surface, Hence the earth's surface temperature is about 25°C warmer than it would have been if these three minor gases were not present. In the absence of these three minor gases the entire earth's surface would be covered with ice. Since these minor gases play a role similar to the glass in a Green house, they are called Green house gases and the phenomenon called the "Greenhouse effect". There are other gases such as methane, and fluorochloro carbons. (Freons) which can also contribute to "Green house effect"

The role of Carbon-di-oxide:

The amount of carbon-di-oxide in the earth's atmosphere has increased steadily in the last 100 years. The amount of Carbon- di-oxide In earth's atmosphere was less than 290 ppm (parts per million) in 1880. In 1990 the amount of Carbon dioxide in the atmosphere has increased to 350 ppm. This increase is primarily on account of burning of fossil fuels and deforestation. About half the Carbon dioxide released by these processes has been absorbed in the ocean. The rest has remained in the atmosphere and has increased the Carbon dioxide

concentration from 290 ppm to 350 ppm in hundred years. The rapid industrialization and population growth is expected to accelerate this process and the Carbon dioxide content in the atmosphere will cross 600 ppm sometime in the middle of the next century. What will be the consequences of doubling the amount of Carbon dioxide in the atmosphere or the climate? In the past 40 million years carbon dioxide content in the atmosphere has never been as high as the 600 ppm and hence we cannot rely on the past experience to predict the consequence of the doubling of Carbon dioxide content of the atmosphere. We must therefore depend on theoretical models to predict future climate.

General circulation models:

Theoretical prediction of the earth's future climate is a difficult task. This is because of the strong interaction between the atmosphere, ocean and biosphere. The earth's climate is strongly modulated by clouds. The amount of cloudiness in the atmosphere is dependent on the water vapour content of the atmosphere and vertical motion. The water vapour content of the atmosphere is dependent on evaporation from oceans and continents. Thus there is a complex coupling between Radiation, Fluid Mechanics, Thermodynamics and Ocean dynamics. Thus the laws of conservation of mass, momentum and energy for the atmosphere and the ocean govern the earth's climate. These conservation laws are written in the form of differential equation and solved numerically by marching in time. These models are called General Circulation models. On account of complex interaction these calculations can be done using a supercomputer. The result obtained from these calculations can provide useful information regarding the nature of climatic change on account of doubling of carbon-di-oxide.

In the last 20 years, many general circulation models have been developed and used to study the impact of the doubling of the Carbon dioxide in the atmosphere. The prediction of these models indicate that the doubling of Carbon di oxide in the atmosphere will lead to a mean global surface temperature increase in the range 1.5 to 4.5^{o}C. There is such a large variation in the prediction of these models on account of the manner in which they have modelled the clouds and the ocean circulation. Further improvements in the modelling of clouds and ocean circulation will require more powerful computers and a better understanding of cloud physics. All General circulation models indicate that temperature changes in the polar regions will be much higher than in the tropics.

Consequences of Global Warming:

If the prediction of General circulation models are realistic, then we can expect the mean global temperature to increase by 2 to 3^{o}C by the middle of the next century. What will be the consequences of such a global warming? The immediate effect of such a warming will be a

rise in sea level on account of thermal expansion of water. This will pose a serious threat to coastal cities and islands. Countries such as Maldives, and Bangladesh will lose a lot of land on account of flooding. A large increase in surface temperature will cause a global change in climatic patterns. The interior of large continents (Such as U.S.A., Europe and Soviet Union) will become drier while tropical regions will probably receive higher rainfall. This will have profound influence on the pattern of global food production. The effect of the temperature increase on the biosphere is difficult to predict. There may be a change in the pattern of pest attack on crops and epidemics in human beings.

Can we prevent Global warming :

To prevent Global Warming we need to reduce substantially the burning of fossil fuels and deforestation. About 70% of Carbon dioxide released in the atmosphere comes from industralizing countries. The sudden reduction of fossil fuel consumption in theses countries will have a crippling impact on the transport sector and the economy. The nuclear lobby has been strongly advocating the use of nuclear fuels instead of fossil fuels for the production of electricity. Such a switch will not make a substantial impact on global warming. This is because there are gases other than CO_2 which contribute to global warming. The combined effect of other Green house gases such as methane, chloroflouro carbon, Nitrous oxide, and Ozone on global warming can be equal to that of Carbon dioxide. In the last 100 years the amount of methane in the atmosphere has increased by 200%. The main source of methane is rice fields, cattle and swamps. There are no simple methods to reduce the amount of methane production by human activities. since it is so closely linked to the agricultural activities in developing countries. The reduction of fossil fuel burning by industrialized countries may be possible on the lines of Montreal Protocol of 1988 for the reduction of emission of Fluorochloro carbons (Freons). There are however no simple and easy ways to prevent global warming. Hence the best approach at present is to be prepared for global warming in the next 50 years. The effects of global warming are not as dramatic as earthquakes, tornadoes or Volcanic eruptions. There will be sufficient time for nations to plan for adverse consequences of global warming, if they start thinking from now. The threat of global warming may be blessing in disguise. If the industrialized nations decide to make to transition from a fossil fuel bound economy to one bound on renewable energy then threat of global warming will be mitigated substantially and our environment will be subject to less pollution.

KARNATAKA RAJYA VIJNANA PARISHAT

Indian Institute of Science Campus, Bangalore-560 012.

GENESIS

As early as 1977, Karnataka State Council for Science and Technology identified a project on 'Popularisation of Science. Sri. M.A. Sethu Rao, the then Joint Secretary of the KSCST initiated the project as its Convenor. The objectives of the project were two-fold:

* To publish a science monthly in Kannada (Balavijanana).

* To bring together several individuals and groups in Karnataka already engaged in tasks of popularisation of science.

These objectives were fulfilled and Karnataka Rajya Vijanan Parishat (KRVP) founded in 1980 as an autonomous registered society started with 25 units in the beginning and now it is an organisation of about 400 units, 4 large Science Centres and 42 small Science Centres spread across the length and breadth of Karnataka. Activists and promoters of KRVP include scientists, teachers, administrators, doctors and other professionals. KRVP is proud of its links with sister organisation such as KSCST, ASTRA, CES (IISc) etc.

It has secured the academic support of scientists from the Indian Institute of Science (especially ASTRA group), Visvesvaraya Industrial and Technological Museum, National Aeronautical Laboratory, Association of Bangalore Amateur Astronomers and other national and state bodies of Science and Technology As a member of the All India Peoples Science Network KRVP is actively associated with the People's Science Movements of our country.

KRVP receives an annual grant from the Department of Science and Technology, Government of Karnataka and receives occasional project funding from NCSTC (Government of India)., CAPART, DNES, etc.

OBJECTIVES

Primarily KRVP strives to aquaint the masses with Science, its method, achievements and progress with a slant on inculcation of Scientific attitude. It attempts to enlighten people about the current problems in different areas from a Scientific perspective, KRVP's main target groups are children, students, youth, teachers and people especially those in rural areas.

KRVP'S CONSTITUTION

1. Vijnana Parishat's seminal activities center around the voluntary units started in villages, towns, educational institutions and industries.

2. District Committees coordinate the activities of the units in the districts.

3. General Council of KRVP includes donors, donor institutions, Convenors of units.

4. General Council elects a fourteen member Executive Committee.

5. Executive Committee elects a President, two Vice-Presidents, Secretary and Treasurer.

At present KRVP has on its roll 10,000 members.

RESOURCES

In addition to regular grants from Government of Karnataka and project funding from Government of India. KRVP's financial resources include membership fee from donors, funding for specific projects from other organisations like CAPART, CSIR, NCSTC etc.

GROWTH

There is a substantial growth in the number of units during the period 1980-90.

(Vide annexure)

PROGRAMMES

Some of the major programmes of KRVP are:

* Creation of Scientific literature in Kannada
* Production of Science films, Science kits, slides etc
* Organisation of workshops, seminars and environmental camps
* Organisation of Science Conferences
* Establishment of Science Centers
* Conducting surveys pertaining to specific areas.
*

PUBLICATIONS

KRVP's periodical publications are Balavijanana, a monthly science magazine in Kannada and Vijnana Deepa, a monthly poster magazine in Kannada and KRVP Bulletin, a quarterly newsletter of KRVP citing the activities of KRVP in brief.

KRVP is also publishing popular Science books in Kannada on a wide variety of topics. These books are published and sold on marginal profit basis. Many of them have been reprinted (See annexure)

A few publications are in English also: Guide to Night Sky, How to build a Telescope, Clusters, Nebulae etc. At present 50 books have been published by KRVP and some of them are so popular that they are out of print.

PRODUCTION OF FILMS AND SLIDES

With the assistance of Department of Science and Technology, Government of Karnataka KRVP produced six science films on various topics namely:

a) Shakti (Energy)

b) Parisara (Environment)

c) Neenarigadeyo Ele Manava (Pollution)

d) Manjumusukida Haduyalli (Shadows of dawn)

e) Modalahejje (Health)

f) Mara Mattu Parisara (Tree and Environment).

KRVP has identified audio visual communication as an effective media. It maintains library of films, slides, video cassettes which are widely circulated.

WORKSHOPS

Writers' Workshops

Since the year of its inception, KRVP has been organising workshops for Science writers in Kannada so as to train and equip them with the technique of presenting science topics in a popular manner. This programme has been sponsored by NCSTC, Government of India. As of present, KRVP has organised seven such workshops.

Telescope Workshops

A few of the selected units of KRVP along with the expert guidance from the members of Bangalore Amateur Astronomers Association (ABAA) and Visveswaraya Industrial and Technological Museum (VITM) are engaged in workshops to produce reflective telescopes.

In 1985, when Halley comet appeared, several units of KRVP which participated in telescope workshops helped the public not only in viewing the comet but also in understanding other astronomical features. A few lakhs of people were benefited.

Telescope workshop has participation from other states also and such workshops are being initiated in other states

KRVP has also conducted one evaluation workshop so as to get a feedback

Workshops on production and utilisation of science kits, toys posters and other supporting materials have been ongoing programmes.

Science Lecture Competition

To train students in lecture mode of science communication, KRVP is conducting a state level popular science lecture competition in Kannada.

Environmental camps

Several units of KRVP and Belgaum Vijnanakendra in collaboration with Department of Science & Technology have been conducting environmental awareness camps. Camps were organised in Jamboti forest, Deverayana Durga, Nagarahole.

Drinking Water Awareness Camp.

During 1989-90, 25 camps were organised and basic information and purification techniques were imparted. In Tumkur district, campus were held in each mandal panchayat area.

Drug Awareness Camp

One day workshop was organised by KRVP in association with the organisation 'Scientists for Peace and Development'. In this workshop, doctors, phramacologists, activists of KRVP and social workers were brought together in order to identify the prevailing problems of drugs and drug policy. The ignorance and wrong notions prevalent among public due to propaganda by drug industries, free availability of banned drugs, havocs caused by quacks, adulteration in drug industry were the main concern of the participants.

Workshop on identification of minimum S & T core for common man

Under this project supported by NCSTC, experts were involved in framing suitable questionnaire eliciting information from common people in areas such as Environment, Health, Scientific Attitude, Agriculture etc. Seminar was held where experts discussed the questionaire and identified possible areas where KRVP can intervene and decide on the minimum S & T knowledge necessary for common man.

MASS CONTACT PROGRAMMES

Vijnana Sammelanas

KRVP has hitherto organised 3 state level science conferences at Dharwad, Gulbarga and Tumkur respectively. The Sammelana includes:

* Seminars
* Kavi Ghosthi (Poets' meet)
* Popular science lectures
* Science Exhibition
* Science festivals

Some units of KRVP have organised science festivals. Tumkur district committee of KRVP arranged a week long festival in all taluks. A mobile van carrying artists, exhibits, films visited several places, where day-long programmes were conducted.
Birth Centenary of Sri. Srinivasa Ramanujam and Dr. C.V. Raman were celebrated at different places in Kolar district for a period of one month. About 100 lectures were organised in schools.

Bharat Jan Vijnana Jatha

KRVP is one of the leading organisations which sponsored Bharat Jan Vijnana Jatha conducted with the support of NCSTC. Jatha passed through 23 centres in Karnataka and a good number of artists, scientists and teachers were involved. This Jatha resulted in establishing a net work of all the Peoples Science Movements in the country called AIPSN (All India People's Science Network). KRVP is a member of this network.

All India People's Science Congress

As a member of AIPSN, KRVP participated in first and second All India People's Science Congress held at Cannanore and Calcutta respectively. It hosted the third All India People's Science Congress at Vidyanagar, Bangalore during 8-11 March 1990.

During the congress, three parallel sub-congresses were held on literacy, Self-reliance and Health.

Literacy sub-congress was significant from the point of view of the prospective 'Bharat Gyan Vijnana Jatha' sponsored by Human Resource Development Department, Government of India. All PSMs including KRVP are taking up this literacy campaign throughout the country.

In addition to the sub-congresses, there were Popular Science lectures, exhibitions, and discussions on the much debated issues like Narmada Valley project.

A number of leading scientists, engineers, policy makers and other experts in various fields participated in the congress by presenting their papers, and intervening in discussions.

Debate on Kaiga Project

When Government of Karnataka and Government of India in a joint venture proposed to install a nuclear power plant at Kaiga, Karwar district of Karnataka, the issue became controversial. KRVP in association with KSCST organised an open debate and invited experts, government officials, politicians and welfare organisations to present their views frankly about the project.

Dissemination of S & T knowledge to rural areas

Many units of KRVP are actively participating in disseminating appropriate technology designed to fulfill the needs of rural masses. Many volunteers were trained to construct Astra Ole and they in turn are attempting to popularise the same in their respective villages. Similar action was taken with respect to Swosthee ole, and solar cookers. Some villages are aiming to declare themselves as smokeless villages by using Astra Ole.

Development and diffusion of various kinds of stoves for the specific local requirements was carried out by Dr. M.S. Hegde in Uttara Kannada district. As a part of the programme, lecture cum demonstration programme was conducted for Gramasevikas, Panchayat heads and other people who have direct contact with the public. Separate manuals were prepared for this purpose. Training classes were conducted for the construction of such stoves. This activity was carried out with KRVP unit of kumta as an information centre.

In additions to this, KRVP has distributed wind monitoring units to several units, who inturn furnish the wind speed recordings to scientists for identifying suitable location of wind mills.

Some of the units have taken up afforestation programmes with the help of forest department of Government of Karnataka and the dynamic participation of school children.

Survey of villages with respect to the source and extent of energy requirements has also been undertaken by several units in the project 'Urjagram'

Women folk are trained about preservation of perishable goods and optimum utilisation of consumer goods by enlightening them about the principles of science involved.

Science Week, Science Month. etc.

Each unit of KRVP is conducting some routine activities every year. Some of them are:

1. Science Week during September 14-21
2. National Science Day 28, February
3. World Environment Day, 5 June

CAMPAIGNS

In association with Scientists and Engineers for Peace and Development (SEPAD), KRVP has carried out signature campaign on Bhopal tragedy, campaign against Nuclear Weapons and Star Wars.

Antisuperstitution campaign

KRVP units have organised demonstrations and imitations of godmen and quacks in order to expose of scientific tricks behind these. The campaigns have been initiated by Sri. Narendra Nayak and Sri. M.R. Nagaraju.

During 1987 KRVP hosted a Southern Region Workshop on "Impediments to the development of S&T temper" This project was catalysed and supported by NCSTC.

VIJNANA KENDRAS

Each large Vijnana Kendra tries to launch its unique programme.

Objectives of Vijnana Kendras

* To enable students to familarise themselves with fundamental concepts in mathematics, physics, chemistry and biology through experiments.
* To develop scientific attitude
* To provide a platform for science activities in villages, towns, taluks etc.

TUMKUR SCIENCE CENTRE

Project started in November 1987.

Activities

* Summer camps for students
* Science month celebration
* Mobile Planetarium-sky viewing activity

* Picture writing competition
* Publication of books
* Environment Conservation awareness drive.

Facilities available

* Mobile planetaria
* Audio visual equipment
* Science models and kits
* Library

MYSORE VIJNANA KENDRA

Project started in March 1987

Facilities available

1. Models and kits
2. Computers
3. Planetaria
4. Library
5. Posters and slides
6. Mini science Laboratory

Actitvities

1. Popular science lectures
2. Science exhibitions

3. Computer awareness programme

4. Workshop for students/teachers

5. Use of electrical appliances-Workshop for women.

BELGAUM VIJNANA KENDRA

Started in 1985

List of items and exhibits:

Demonstration models

1. Infinite/multiple images - by keeping mirrors at 60^{o}

2. Flying in air-mirrors perpendicular to each other

3. Hologram

4. See your own pupil with the help of concave mirror, the contraction of pupil can be seen

5. Stroboscope

6. Magic coil - with the help of a concave mirror, real image of a coin can be photographed even

7. Mirror puzzle

8. Periscope

9. Shortest distance - optical illusions

10. Gravity curve - showing period is independent of amplitude

11. Wrong labels, mathematical puzzle.

12. Pin screen - with equal distribution of pressure the pins will not pierce

13. Food pyramid - showing the interdependence of species in nature

Posters

Subject : Energy and Environment (30 posters)

Kits

Optics kit illustrating Dispersion, Laws of Reflection, Convergence of Parallel rays from convex lens, divergence using concave lens and total internal reflection.

Astrolabe used for observation of moon every day and noting angles of elevation, declination etc.

Sextant used for measuring heights of distant objects.

Manuals

There are useful hand books for students for carrying out simple experiments
Development of plant life
Chemical Changes
Environment
Man & Environment
Population pressure
Adaption to Environment.

Camps and Workshop

Students and teachers participate in these workshops:

Electronics Workshop

Assembling low cost scientific equipment

Regular training for anganwadi teachers who come to the centre in batches once in every 10 days

Environment workshop

Environmental study camps

Popular science lectures

Vijanana mela

With the support of NCSTC & DST (GOK, GOI), Vijanana melas have been organised in rural areas (Sankeswar, Raichur, Mudhol, Kalloli etc).

Computer Awareness Programme is one of the ongoing programmes for students

Simple Experiments to test quality of water, air pollution levels etc.

FUTURE PLANS OF KRVP

To organise science conferences at the district level and at taluk level.

To extend facilities to units to develop into small science centres to set up large centres in each district of Karnataka.

To enhance the circulation of Balavijanana and Vijnana Deepa

To increase the tempo of publication of books & Science films including videos

To enhance the production of science kits and commercialise them

To establish planetaria.

Karnataka Rajya Vijnana Parishat

Indian Institute of Science Campus, Bangalore-560 012.

THIRD ALL INDIA PEOPLE'S SCIENCE CONGRESS
VIDYANAGAR, BANGALORE
8-11, MARCH 1990

8 March 1990

SESSION:1	INAUGURATION	
10.00-13.00 H	Welcome Address	Prof. J. R. Lakshmana Rao President, KRVP
	About AIPSN	Prof. B. M. Udgaonkar President, AIPSN
	Inaugural Address	Shri K. H. Ranganath Hon'ble Minister for Education, Agriculture & Forests
	President's Remarks	Prof. C. N. R. Rao Director, IISc.,
	Role of NCSTC	Dr. P. K. B. Menon NCSTC, New Delhi
	Role of DST(K)	Sri Lukose Vallatharai DST Govt. of Karnataka
	Vote of thanks	Shri. M. A. Sethu Rao Secretary, KRVP
	COFFEE	
	Keynote Address 1	Health-Dr. T. Sundararaman
	Keynote Address 2	Literacy-Dr. M. P. Parameswaran
	Keynote Address 3	Self Reliance- Dr. Prabir Purakayastha and Dr. Venkatesh B.Athreya
1300-1400 H	LUNCH	
SESSION:2 1400-1630 H	Convenor's Meeting	

LITERACY SUB CONGRESS

09-03-90

SESSION 3(L)

CHAIRMAN: Dr. M. P. Parameswaran

0930-1300 H	1. Literacy Programmes in 8th Five Year Plan	Dr. L. Misra
	2. Science for the People	Dr. Sanjay Kumar Biswas
1300-1400 H	LUNCH	

SESSION 4(L)

1400-1800 H Experience of Literacy Programme

1.	Karnataka	Shri. Madan Gopal
2.	Tamilnadu	Shri. Ranjani Doss
3.	Kerala	Prof. P.K. Ravindran
4.	Pondicherry	Shri. T. Krishnamurthy
5.	West Bengal	Shri. Shankar Chakrabrathy
6.	Ethiopia, Tanzania	Shri. Madan Gopal

10-3-1990

SESSION 5(L)

0930-1300 H **PSM & LITERACY**

CHAIRMAN: Dr. G. Ramakrishna

i.	Science and Content of Literacy	Dr. Anitha Rampal
ii.	Unifying role of Science	Dr. Vinod Raina
iii.	Relevance of PSM Experience	Shri. R. Radhakrishnan
iv.	BGVJ & BJVJ	Dr. T. Sunderaraman

1300-1400 H LUNCH

SESSION 6 (L) FUTURE PROGRAMME

CHAIRMAN: Dr. M. P. Parameswaran

1. Literacy status in India and its perspectives — Shri Lingadevaru Halemane
2. Developing Instructors — Dr. A. K. Sinha

SELF RELIANCE CONGRESS

9th March 1990
Session 3(S) Chairman : Dr. Trivedi

0900-1300 H
-

Conceptual Issues of Self Reliance
-Dr. Prabir Purkayastha, Dr. Venkatesh B. Athtreya

Research and Development in Scientific And Technological Self Reliance
-Prof. A. K. N. Reddy

Scientific Institutions in S&T Innovation and Manpower Generation
-Prof. S. K. Rangarajan

Scientific Institutions and Self Reliance
-Shri. Dinesh Abrol

Discussions

1300-1400 H LUNCH

Sub Group 4 (S)
1400-1730 H

Theme Papers
Chairperson: Dr. Venkatesh B. Athreya

Theme Paper on Energy
-Shri. Ashok Rao

Theme Paper on Electronics
-Dr. Prabir Purkayastha

Theme Paper on Natural Resources
-Dr. Somal Chatterjee

Discussions

Sub Group 4 (S.1)	Theme Papers
1400-1730 H	Chairperson: Dr. Rangarajan
	Theme Paper on Agriculture -Dr. S. K. Sinha
	Theme Paper on Seeds -Smt. Usha Menon
	Discussions
1830-1930	
10th March 1990	
Session 5 (S)	Presentation by PSMs
0930-1300 H	Chairperson: Sri P. Purkayastha
	Presentation on Energy -FOSET
	Presentation on Electronics -DSF
	Presentation on Electronics -FSD
	Presentation on Oil Exploration -PBVM
1300-1400 H	LUNCH
Session 5 (S1)	Chairperson: Prof. M. Mahadevappa
0930-1300H	Presentation on Agriculture -Dr. Pathiyoor Gopinath
	Presentation on Agriculture -Shri. Praful Chandra.
Session 6 (S)	Action Programme on Self Reliance
1400-1730 H	Chairperson: Shri. S. Rajagopalan
	Presentation of Discussions on Energy, Electronics and Natural Resources
	Presentation of Discussions on Agriculture, Seeds and Mass Consumption Goods
	Action programme and Resolution

HEALTH CONGRESS

9-3-1990

SESSION- (3.H)- PEOPLE'S INTERVENTION IN HEALTH

Chairman Dr. B. Ekbal

9.30 H	- PSM Prespective on Primary Health Care Dr.T. Sundararaman
10.00 H	-The K.S.S.P & other PSM experiences Dr. A. Ramankutty, K.S.S.P.
10.30 H	-The MFC experience Dr. Anant Phadke
10.50.H	-The Andhra Polyclinic experience Dr. Sesha Reddy
11.15 H	-The VHAI & AIDAn experience Dr Mira Shiva
11.45 H	-Other Group experience & discussion
13.00 H	-Lunch

SESSION-(4H)-PRIORITY AREAS FOR PEOPLE'S INTERVENTION

Chairperson:	Dr. Mira Shiva
14.00 H	-Drug Policy-Amitava Guha. FMRAI
15.00 H	-The National Health Policy & Vertical Health Programmes Dr. K. P. Aravindan, KSSP.
16.00 H	-Occupational Health Dr. Mahesh Mansukhani, DSF.
17.00 H	-Resolutions on priority areas

10th March 1990

SESSION -5(H)-WOMEN AND HEALTH

Chairperson:	Dr. Nimita Bhat
0930 H	- Family Planning Programme Dr. Mohan Rao
1300 H	-Women's and Health Dr. Meera Shiva

SESSION-6 (H)-ACTION PROGRAMME ON PRIMARY HEALTH CARE

Chairperson: Dr. Sesha Reddy

1400 H - Presentation of Action Programme

1500 H - Discussion and finalisation

11 March 1990

VALEDICTORY PLENARY SESSION

0930-1300 H -Presentation of Sub Congress Proceedings and Resolutions
Valedictory remarks.

Popular Science Lecture Programmes

08-03-1990

1830-1930 H	:(1A)	Dr. Bhaskar Datta	First 3 minutes
1830-1930 H	:(1B)	Dr. Raghavendra Gadagkar	Insects

09-03-1990

1830-1930 H	:(2A)	Dr. A. G. B. Reddy	Geological Exploration
1830-1930 H	:(2B)	Prof. Rama Prasad	Water Resources
1930-2100 H			Discussion on Narmada Project

10-03-1990

1830-1930 H	:(3A)	Dr. V. Raja Raman	Computers
1830-1930 H	:(3B)	Dr. J. Sreenivasan	Global Warming

THIRD ALL INDIA PEOPLE'S SCIENCE CONGRESS

VIDYANAGAR, BANGALORE

8 - 11, MARCH 1990

RESOLUTIONS

1. NARMADA VALLEY PROJECT :

The Third All India People's Science Congress held at Bangalore from March 8 - 11, 1990 considered the issues surrounding the Sardar Sarovar and Indira (Narmada) Sagar dams across the river Narmada. In particular, the People's Science Congress views the impending displacement of a very large population and the human cost of the project with a great degree of concern.

It has been the experience of major projects in the past that the rehabilitation of displaced people has been grossly neglected and the social costs and benefits have been unequally shared. The Congress supports the struggle of the people and demands justice be rendered to them. The Congress calls upon the Government to immediately review the project and to constitute high level Ministerial Committee comprising of concerned Central Ministers and Chief Ministers of States to review the rehabilitation aspects of the projects.

The Congress also calls upon the Government to consider alternatives to the proposed projects. The Congress demands all information concerning these projects and their alternatives be immediately made available.

2. PHARMACEUTICAL INDUSTRY :

The Third All India People's Science Congress notes with concern that the present Drug Policy has resulted in rise in drug prices, reduced production of essential drugs and increased dependence on the Foreign Sector. It further recommends:

i) Steps to be taken to increase production of essential drugs
ii) Escalating drug prices should be brought down
iii) Irrational and Hazardous drugs should be banned
iv) A National Drugs and Therapeutics Authority (NDTA) should be set up with Statutory Powers to oversee and monitor the Industry.
v) The Multinational Sector, which has a negative role in the Industry, should be nationalised on the lines suggested by the Hathi Committee report of 1975.
vi) The Public Sector should be encouraged to play a leading role
vii) No drugs including those from indigenous systems, should be kept out of purview of drug testing and therapeutic assessment mechanisms.

The Congress further urged the Government to hold wide - ranging discussions with all sections before coming to a decision regarding changes to be incorporated in the Drug Policy.

3. SELF - RELIANCE :

1) The Congress decided to actively promote field - based technology development / application programmes.

Eg. Rural Artisanal leather industries, clay - based pottery production, food processing, dairy.

2) It was decided to design alternative strategies for decentralised seed forms. The congress decided to draw up plans for future action, specifically including forging of active linkages with C.S.I.R., S.W.A. and the public sector officers associations.

3) It was decided to organise a series of regional workshops of P.S.M.'s, Scientists and others concerned so as to mount pressure to scrap the seed - import policy of Government of India.

THIRD ALL INDIA PEOPLE'S SCIENCE CONGRESS
VIDYANAGAR
KARNATAKA RAJYA
PARISHAT

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